United States Department of Agriculture

Natural Resources Conservation Service

Special Soil Survey Report for Island of Kahoolawe, Hawaii

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas.

Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app? agency—nrcs) or your NRCS state soil scientist (http://soils.usda.gov/contact/ state_offices/).

Great differences in soil properties can occur within short distances. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

Cover: Cracks on the soil surface at Luakealialalo.

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Island of Kahoolawe, Hawaii

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KAHOOLAWE is the smallest of the eight major islands in the State of Hawaii. It is part of Maui County and lies approximately 7 miles southwest of Maui (fig. 1). It has a land area of 28,471 acres. The island is about 11 miles long and 6.5 miles wide at the widest part. The highest point is 1,477 feet at Puu Moaulanui on the east side of

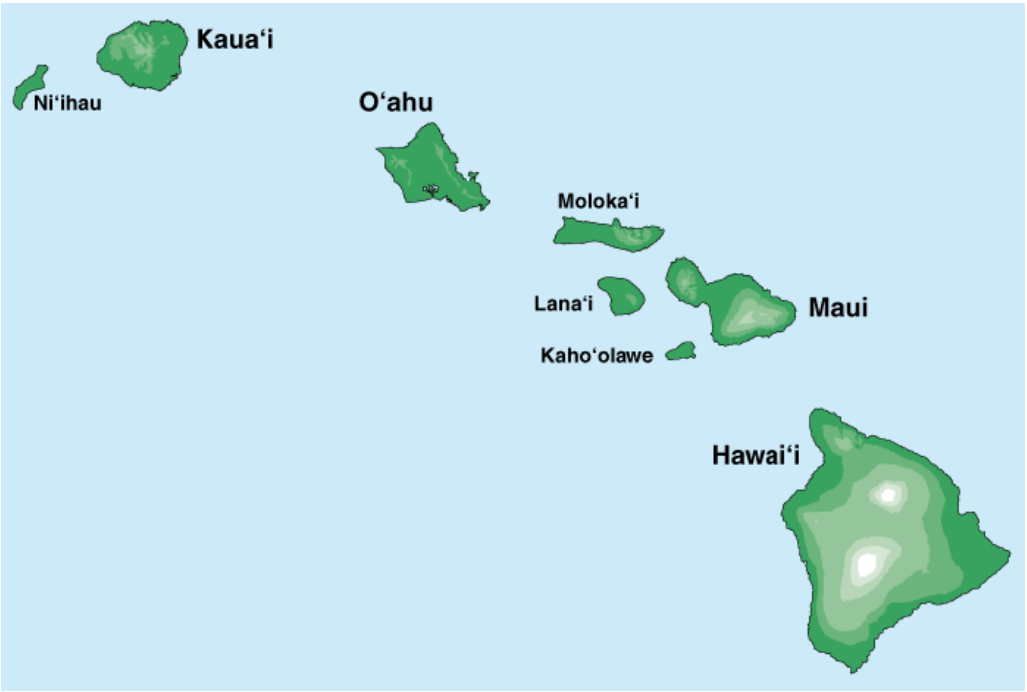

Figure 1.—Location of Island of Kahoolawe in Hawaii.

Figure 2.—An area of Beaches, 0 to 5 percent slopes (map unit 4) and Typic Haplotorrerts, extremely stony, 3 to 15 percent slopes (map unit 12).

Lua Makika, in the eastern part of the island. The island is not inhabited; however, there is a small base camp at Hanakanaea (Smuggler's Cove) in the southwestern part of the island (fig. 2). There are no perennial streams.

General Nature of the Survey Area

Kahoolawe was used for bombing and offshore gunnery practice by the military beginning in 1941. Bombing was halted in 1990. The island was under U.S. Navy control beginning in 1954. The Federal government returned Kahoolawe to the State in 1994. There remain many unexploded ordinance on the surface and underground after 50 years of target practice.

Kahoolawe lies on the leeward side of Maui's Haleakala Volcano. Haleakala's land mass deflects the northeast trade winds and sends persistent strong winds over Kahoolawe from the east. Climatic data for Kahoolawe is very limited and the annual rainfall is estimated to range from about 10 inches near the southwestern end of the island to about 25 inches on the plateau near the summit. The rainfall estimate is based on the vegetation and soil conditions, which are similar to Molokai and Lanai, and on limited rainfall data. Table 1 gives data on rainfall and temperature for the period 1990 to 1993 (NOAA, 1993).

The island is windswept, and large areas are eroded and bare of vegetation (fig. 3). Much of the erosion was caused by cattle and sheep, when the island was used for ranching, and by goats, which ran unchecked for decades until they were eradicated in the early 1990s. The bombings and training activities also had a part in causing the erosion. Dominant vegetation is kiawe, piligrass, and buffelgrass in the areas with low rainfall and Natal redtop, lantana, pitted beardgrass, uhaloa, and koa haole in the

areas with higher rainfall. There are no trees except for kiawe, some wili wili, and the planted windbreaks of tamarisk and ironwood.

The soils on the plateau (Typic Haplotorrox), from about 700 feet in elevation to the summit, are mainly severely eroded by wind and water and are bare of vegetation. Downwind from the eroded plateau where the wind velocity decreases, the soils have a mantle of windblown material (Typic Torriorthents and Typic Haplocambids). The perimeter of the island has mainly shallow soils (Lithic Torriorthents) and rock outcrop.

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

Figure 3.—An area of Typic Haplotorrox, windblown, 3 to 8 percent slopes, hummocky (map unit 19). The island is windswept, and large areas are bare of vegetation.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit

component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map Information

The soil survey area was mapped at 1:24,000. Refer to the bar scale on the map for accurate map measurements.

For the source of map, see the Natural Resources Conservation Service Web Soil Survey at http://websoilsurvey.nrcs.usda.gov. The coordinate system is UTM Zone 4N NAD83. The map is generated from NRCS data certified as of October 2010.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on this map. As a result, some minor shifting of map unit boundaries may be evident.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. The soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management.

Some map units are made up of two or more major soils or miscellaneous areas.

These map units are complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Typic Haplotorrox, wind polished-Typic Torriorthents, badland, complex, 3 to 12 percent slopes is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rubble land, 3 to 12 percent slopes is an example.

Table 2 lists the map units in this survey area. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

1—Typic Torriorthents, badland-Typic Haplotorrox-Rock outcrop complex, 10 to 30 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Torriorthents, badland and similar soils: 40 percent
Typic Haplotorrox and similar soils: 35 percent
Rock outcrop: 25 percent

Description of Typic Torriorthents, Badland

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 10 to 30 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.2 inches)

Interpretive Groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e

Typical Profile
C—0 to 60 inches: stony silty clay loam

Description of Typic Haplotorrox

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 10 to 30 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 10.0
Available water capacity: Moderate (about 8.0 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
A1—0 to 6 inches: silty clay loam
A2—6 to 12 inches: silty clay loam
2Bw1—12 to 22 inches: silty clay
3Bw2—22 to 36 inches: silty clay
3Bw3—36 to 60 inches: silt loam

Description of Rock Outcrop

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 10 to 30 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
R—0 to 60 inches: bedrock

2—Typic Torriorthents, badland-Typic Torriorthents, eolian, complex, 5 to 25 percent slopes

Map Unit Setting

Landscape: Shield volcanoes
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Torriorthents, badland and similar soils: 50 percent
Typic Torriorthents, eolian and similar soils: 30 percent
Minor components: 20 percent

Description of Typic Torriorthents, Badland

Setting
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 5 to 25 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.2 inches)

Interpretive Groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e

Typical Profile
C—0 to 60 inches: stony silty clay loam

Description of Typic Torriorthents, Eolian

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 5 to 25 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet

Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 5.0
Available water capacity: Moderate (about 8.6 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 9 inches: silty clay loam
C—9 to 60 inches: silty clay

Minor Components

Rock outcrop
Percent of map unit: 10 percent
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Typic Haplotorrox
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

4—Beaches, 0 to 5 percent slopes

Map Unit Setting

Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 50 inches
Mean annual air temperature: 73 to 77 degrees F
Frost-free period: 365 days

Map Unit Composition

Beaches: 95 percent
Minor components: 5 percent

Description of Beaches

Setting
Landform: Beaches
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sand

Properties and Qualities
Slope: 0 to 5 percent
Drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (K_{sat}): High or very high (6.000 to 19.980 in/hr)
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate maximum: 99 percent
Available water capacity: Low (about 3.5 inches)

Interpretive Groups
Land capability classification (nonirrigated): 7s

Typical Profile
C1—0 to 13 inches: sand
C2—13 to 60 inches: sand

Minor Components

Rock outcrop
Percent of map unit: 5 percent
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

5—Typic Haplotorrox, 5 to 15 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox and similar soils: 90 percent
Minor components: 10 percent

Description of Typic Haplotorrox

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 5 to 15 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None

Sodium adsorption ratio maximum: 10.0
Available water capacity: Moderate (about 8.0 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
A1—0 to 6 inches: silty clay loam
A2—6 to 12 inches: silty clay loam
2Bw1—12 to 22 inches: silty clay
3Bw2—22 to 36 inches: silty clay
3Bw3—36 to 60 inches: silt loam

Minor Components

Typic Haplotorrox, windblown
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

6—Typic Haplotorrox, wind polished, 3 to 12 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox, wind polished and similar soils: 80 percent
Minor components: 20 percent

Description of Typic Haplotorrox, Wind Polished

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 3 to 12 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet

Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 10.0
Available water capacity: Low (about 5.8 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
Bw1—0 to 8 inches: silty clay loam
Bw2—8 to 15 inches: silty clay loam
BC—15 to 32 inches: silty clay loam
C/Cr—32 to 60 inches: silty clay loam

Minor Components

Typic Haplotorrox, windblown
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Typic Torriorthents, badland
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

7—Typic Haplotorrox, wind polished, 12 to 20 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 15 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox, wind polished and similar soils: 80 percent
Minor components: 20 percent

Description of Typic Haplotorrox, Wind Polished

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 12 to 20 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 10.0
Available water capacity: Low (about 5.8 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
Bw1—0 to 8 inches: silty clay loam
Bw2—8 to 15 inches: silty clay loam
BC—15 to 32 inches: silty clay loam
C/Cr—32 to 60 inches: silty clay loam

Minor Components

Typic Haplotorrox, windblown
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Typic Torriorthents, badland
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

8—Typic Haplotorrox, wind polished-Typic Torriorthents, badland, complex, 3 to 12 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox, wind polished and similar soils: 40 percent
Typic Torriorthents, badland and similar soils: 40 percent
Minor components: 20 percent

Description of Typic Haplotorrox, Wind Polished

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 3 to 12 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 10.0
Available water capacity: Low (about 5.8 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
Bw1—0 to 8 inches: silty clay loam
Bw2—8 to 15 inches: silty clay loam
BC—15 to 32 inches: silty clay loam
C/Cr—32 to 60 inches: silty clay loam

Description of Typic Torriorthents, Badland

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 3 to 12 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.2 inches)

Interpretive Groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e

Typical Profile
C—0 to 60 inches: stony silty clay loam

Minor Components

Typic Haplotorrox
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Typic Haplotorrox, windblown
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

9—Typic Torriorthents, eolian, 3 to 15 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Torriorthents, eolian and similar soils: 80 percent
Minor components: 20 percent

Description of Typic Torriorthents, Eolian

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 3 to 15 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 5.0
Available water capacity: Moderate (about 8.6 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 9 inches: silty clay loam
C—9 to 60 inches: silty clay

Minor Components

Typic Haplotorrox
Percent of map unit: 15 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Typic Haplotorrox, dark surface
Percent of map unit: 5 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

11—Typic Torriorthents, eolian, 15 to 30 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Torriorthents, eolian and similar soils: 80 percent
Minor components: 20 percent

Description of Typic Torriorthents, Eolian

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 15 to 30 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 5.0
Available water capacity: Moderate (about 8.6 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 9 inches: silty clay loam
C—9 to 60 inches: silty clay

Minor Components

Typic Haplotorrox
Percent of map unit: 15 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Rock outcrop
Percent of map unit: 5 percent
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

12—Typic Haplotorrerts, extremely stony, 3 to 15 percent slopes

Map Unit Setting

Landscape: Shield volcanoes
Elevation: 10 to 120 feet
Mean annual precipitation: 18 to 30 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrerts and similar soils: 80 percent
Minor components: 20 percent

Description of Typic Haplotorrerts

Setting
Down-slope shape: Linear
Across-slope shape: Linear

Properties and Qualities
Slope: 3 to 15 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Very low to moderately high (0.001 to 0.200 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive Groups
Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 6s

Typical Profile
A—0 to 10 inches: clay
Bss—10 to 60 inches: clay

Minor Components

Typic Haplocambids, deep
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Rock outcrop
Percent of map unit: 5 percent
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Typic Torrifluvents
Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread and rise
Down-slope shape: Linear
Across-slope shape: Concave

13—Typic Torrifluvents, 0 to 6 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 100 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Torrifluvents and similar soils: 85 percent
Minor components: 15 percent

Description of Typic Torrifluvents

Setting
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium

Properties and Qualities
Slope: 0 to 6 percent
Depth to restrictive feature: None within 60 inches

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: Occasional
Frequency of ponding: Frequent
Calcium carbonate maximum: 99 percent
Available water capacity: Moderate (about 7.2 inches)

Interpretive Groups
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 6c

Typical Profile
A—0 to 7 inches: silty clay
C—7 to 40 inches: silty clay
2C—40 to 80 inches: sand

Minor Components

Beaches
Percent of map unit: 15 percent
Landform: Beaches
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Convex

14—Typic Haplocambids, moderately deep, 3 to 12 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplocambids, moderately deep and similar soils: 80 percent
Minor components: 20 percent

Description of Typic Haplocambids, Moderately Deep

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive Groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 10 inches: silt loam
2Bw—10 to 31 inches: stony clay
R—31 to 60 inches: bedrock

Minor Components

Lithic Torriorthents, extremely stony
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Typic Haplocambids, deep
Percent of map unit: 5 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Rock outcrop
Percent of map unit: 5 percent
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

15—Typic Haplocambids, moderately deep-Rock outcrop complex, 5 to 20 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplocambids, moderately deep and similar soils: 60 percent

Rock outcrop: 30 percent
Minor components: 10 percent

Description of Typic Haplocambids, Moderately Deep

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 5 to 20 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 10 inches: silt loam
2Bw1—10 to 18 inches: stony clay
2Bw2—18 to 31 inches: stony clay
R—31 to 60 inches: bedrock

Description of Rock Outcrop

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 5 to 20 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
R—0 to 60 inches: bedrock

Minor Components

Typic Haplocambids, deep
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

16—Typic Haplotorrox, windblown, 3 to 12 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox, windblown and similar soils: 90 percent
Minor components: 10 percent

Description of Typic Haplotorrox, Windblown

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 3 to 12 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 10.0
Available water capacity: Low (about 5.8 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
Bw1—0 to 8 inches: silty clay loam
Bw2—8 to 15 inches: silt loam
BC—15 to 32 inches: silty clay loam
C/Cr—32 to 60 inches: very cobbly silty clay loam

Minor Components

Typic Haplotorrox
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

17—Typic Haplotorrox, windblown, 8 to 20 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox, windblown and similar soils: 90 percent
Minor components: 10 percent

Description of Typic Haplotorrox, Windblown

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 8 to 20 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 10.0
Available water capacity: Low (about 5.8 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
Bw1—0 to 8 inches: silty clay loam
Bw2—8 to 15 inches: silt loam
BC—15 to 32 inches: silty clay loam
C/Cr—32 to 60 inches: very cobbly silty clay loam

Minor Components

Typic Haplotorrox
Percent of map unit: 10 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

18—Typic Haplotorrox, black subsoil, 8 to 20 percent slopes, gullied

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox, black subsoil and similar soils: 85 percent
Minor components: 15 percent

Description of Typic Haplotorrox, Black Subsoil

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 8 to 20 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 10.0
Available water capacity: Low (about 5.8 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
Bw1—0 to 8 inches: silty clay loam
Bw2—8 to 15 inches: silt loam
BC—15 to 32 inches: silty clay loam
C/Cr—32 to 60 inches: very cobbly silty clay loam

Minor Components

Typic Haplotorrox
Percent of map unit: 15 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

19—Typic Haplotorrox, windblown, 3 to 8 percent slopes, hummocky

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 500 to 1,500 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox, windblown and similar soils: 85 percent
Minor components: 15 percent

Description of Typic Haplotorrox, Windblown

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 3 to 8 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio maximum: 10.0
Available water capacity: Low (about 5.8 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
Bw1—0 to 8 inches: silty clay loam
Bw2—8 to 15 inches: silt loam
BC—15 to 32 inches: silty clay loam
C/Cr—32 to 60 inches: very cobbly silty clay loam

Minor Components

Typic Haplotorrox
Percent of map unit: 15 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

20—Rock outcrop-Lithic Torriorthents complex, 50 to 150 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Rock outcrop: 80 percent
Lithic Torriorthents and similar soils: 20 percent

Description of Rock Outcrop

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 50 to 150 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
R—0 to 60 inches: bedrock

Description of Lithic Torriorthents

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope

Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 50 to 150 percent
Surface area covered with stones and boulders: 65.0 percent
Depth to restrictive feature: 16 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive Groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 3 inches: silty clay loam
2Bw—3 to 9 inches: silty clay loam
Cr—9 to 16 inches: silty clay loam
R—16 to 20 inches: bedrock

21—Rock outcrop-Typic Haplotorrerts complex, 8 to 20 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 10 to 120 feet
Mean annual precipitation: 18 to 30 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Rock outcrop: 60 percent
Typic Haplotorrerts and similar soils: 35 percent
Minor components: 5 percent

Description of Rock Outcrop

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 5 to 99 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)

Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
R—0 to 60 inches: bedrock

Description of Typic Haplotorrerts

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 3 to 20 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Very low to moderately high (0.001 to 0.200 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive Groups
Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 6s

Typical Profile
A—0 to 10 inches: clay
Bss—10 to 60 inches: clay

Minor Components

Typic Haplocambids, deep, very stony
Percent of map unit: 5 percent
Landform: Ash fields
Landform position (two-dimensional): Summit and backslope
Landform position (three-dimensional): Mountainflank, side slope, and rise
Down-slope shape: Linear
Across-slope shape: Concave and convex

22—Rock outcrop-Typic Haplocambids, moderately deep, complex, 12 to 25 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Rock outcrop: 55 percent
Typic Haplocambids, moderately deep and similar soils: 45 percent

Description of Rock Outcrop

Setting

Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities

Slope: 12 to 25 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups

Land capability classification (nonirrigated): 8s

Typical Profile

R—0 to 60 inches: bedrock

Description of Typic Haplocambids, Moderately Deep

Setting

Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities

Slope: 12 to 25 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive Groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile

A—0 to 10 inches: silt loam
2Bw1—10 to 18 inches: stony clay
2Bw2—18 to 31 inches: stony clay
R—31 to 60 inches: bedrock

Figure 4.—An area of Lithic Torriorthents.

23—Lithic Torriorthents-Rock outcrop complex, 5 to 15 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Lithic Torriorthents and similar soils: 70 percent
Rock outcrop: 30 percent

Description of Lithic Torriorthents

Setting
Landform: Ash fields (fig. 4)
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 5 to 15 percent
Surface area covered with stones and boulders: 65.0 percent
Depth to restrictive feature: 16 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive Groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 3 inches: silty clay loam
2Bw—3 to 9 inches: silty clay loam
Cr—9 to 16 inches: silty clay loam
R—16 to 60 inches: bedrock

Description of Rock Outcrop

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 5 to 15 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
R—0 to 60 inches: bedrock

24—Lithic Torriorthents-Rock outcrop complex, 15 to 30 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches

Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Lithic Torriorthents and similar soils: 55 percent
Rock outcrop: 45 percent

Description of Lithic Torriorthents

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 15 to 30 percent
Surface area covered with stones and boulders: 65.0 percent
Depth to restrictive feature: 16 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive Groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 3 inches: silty clay loam
2Bw—3 to 9 inches: silty clay loam
Cr—9 to 16 inches: silty clay loam
R—16 to 60 inches: bedrock

Description of Rock Outcrop

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 5 to 99 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Frequency of flooding: None

Figure 5.—An area of Rock outcrop-Lithic Torriorthents complex, 30 to 50 percent slopes (map unit 25).

Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
R—0 to 60 inches: bedrock

25—Rock outcrop-Lithic Torriorthents complex, 30 to 50 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands (fig. 5)
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Rock outcrop: 60 percent
Lithic Torriorthents and similar soils: 40 percent

Description of Rock Outcrop

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 30 to 50 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
R—0 to 60 inches: bedrock

Description of Lithic Torriorthents

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 30 to 50 percent
Surface area covered with stones and boulders: 65.0 percent
Depth to restrictive feature: 16 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive Groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 3 inches: silty clay loam
2Bw—3 to 9 inches: silty clay loam
Cr—9 to 16 inches: silty clay loam
R—16 to 60 inches: bedrock

26—Rubble land, 3 to 12 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 500 feet
Mean annual precipitation: 18 to 30 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Rubble land: 85 percent
Minor components: 15 percent

Description of Rubble Land

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium

Properties and Qualities
Slope: 3 to 12 percent
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (K_{sat}): Very high (19.980 to 19.980 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 3.0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
H1—0 to 60 inches: extremely stony material

Minor Components

Typic Haplotorrerts
Percent of map unit: 15 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

27—Typic Torriorthents, saprolite-Rock outcrop complex, 5 to 20 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 10 to 1,500 feet
Mean annual precipitation: 20 to 35 inches

Mean annual air temperature: 72 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Torriorthents, saprolite and similar soils: 80 percent
Rock outcrop: 20 percent

Description of Typic Torriorthents, Saprolite

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 5 to 20 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.200 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.2 inches)

Interpretive Groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e

Typical Profile
C—0 to 60 inches: stony silty clay loam

Description of Rock Outcrop

Setting
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 5 to 20 percent
Depth to restrictive feature: 0 inches to bedrock (lithic)
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
R—0 to 60 inches: bedrock

28—Typic Haplotorrerts, excavated-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 10 to 120 feet
Mean annual precipitation: 18 to 30 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrerts, excavated and similar soils: 80 percent
Urban land: 20 percent

Description of Typic Haplotorrerts, Excavated

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 0 to 8 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Very low to moderately high (0.001 to 0.200 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive Groups
Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 6s

Typical Profile
A—0 to 10 inches: extremely stony clay
Bss—10 to 60 inches: extremely stony clay

Description of Urban Land

Setting
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread and rise
Down-slope shape: Linear
Across-slope shape: Convex

Properties and Qualities
Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to human-manufactured materials
Capacity of the most limiting layer to transmit water (K_{sat}): Low to moderately low (0.003 to 0.060 in/hr)

Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 0 inches)

Interpretive Groups
Land capability classification (nonirrigated): 8s

Typical Profile
H1—0 to 60 inches: bedrock

29—Typic Haplocambids, deep, 3 to 12 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplocambids, deep and similar soils: 80 percent
Minor components: 20 percent

Description of Typic Haplocambids, Deep

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 3 to 12 percent
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.6 inches)

Interpretive Groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 9 inches: silt loam
Bw—9 to 34 inches: stony silty clay loam
C—34 to 50 inches: stony silty clay loam
R—50 to 80 inches: bedrock

Minor Components

Typic Haplocambids, moderately deep
Percent of map unit: 15 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Rock outcrop
Percent of map unit: 5 percent
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

30—Typic Haplocambids, deep, 8 to 20 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplocambids, deep and similar soils: 80 percent
Minor components: 20 percent

Description of Typic Haplocambids, Deep

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 8 to 20 percent
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.6 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 9 inches: silt loam
Bw—9 to 34 inches: stony silty clay loam
C—34 to 50 inches: stony silty clay loam
R—50 to 80 inches: bedrock

Minor Components

Typic Haplocambids, moderately deep
Percent of map unit: 15 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Rock outcrop
Percent of map unit: 5 percent
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

31—Typic Haplocambids, deep-Typic Haplocambids, moderately deep, complex, 3 to 8 percent slopes

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 0 to 600 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplocambids, deep and similar soils: 55 percent
Typic Haplocambids, moderately deep and similar soils: 40 percent
Minor components: 5 percent

Description of Typic Haplocambids, Deep

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 60 inches to bedrock (lithic)

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Low or moderately low (0.003 to 0.060 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.6 inches)

Interpretive Groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 9 inches: silt loam
Bw—9 to 34 inches: stony silty clay loam
C—34 to 50 inches: stony silty clay loam
R—50 to 80 inches: bedrock

Description of Typic Haplocambids, Moderately Deep

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basalt

Properties and Qualities
Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high or high (0.599 to 1.984 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive Groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e

Typical Profile
A—0 to 10 inches: silt loam
2Bw—10 to 31 inches: stony clay
R—31 to 60 inches: bedrock

Minor Components

Rock outcrop
Percent of map unit: 5 percent
Landform: Lava flows
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Figure 6.—An area of Typic Haplotorrox, dark surface, 3 to 8 percent slopes, severely eroded.

32—Typic Haplotorrox, dark surface, 3 to 8 percent slopes, severely eroded

Map Unit Setting

Landscape: Shield volcanoes and islands
Elevation: 100 to 1,250 feet
Mean annual precipitation: 15 to 25 inches
Mean annual air temperature: 72 to 73 degrees F
Frost-free period: 365 days

Map Unit Composition

Typic Haplotorrox, dark surface and similar soils: 85 percent
Minor components: 15 percent

Description of Typic Haplotorrox, Dark Surface

Setting
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Ash

Properties and Qualities
Slope: 3 to 8 percent
Depth to restrictive feature: None within 60 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately low to moderately high (0.060 to 0.599 in/hr)
Depth to water table: More than 6 feet
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive Groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4c

Typical Profile
Bo—0 to 12 inches: silty clay loam (fig. 6)
2Bo—12 to 60 inches: silty clay loam

Minor Components

Typic Haplotorrox, black subsoil
Percent of map unit: 15 percent
Landform: Ash fields
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank and side slope
Down-slope shape: Linear
Across-slope shape: Convex

Use and Management of the Soils

This report is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for forestland and as sites for buildings, sanitary facilities, and transportation systems. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The report can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this report to locate sources of roadfill and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this report useful. The report can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Interpretive Ratings

The interpretive tables in this report rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited, slightly limited, somewhat limited,* and *very limited*. The suitability ratings are expressed as *well suited, moderately well suited, poorly suited,* and *unsuited* or as *good, fair,* and *poor*.

Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations appear in order from the most limiting to the least limiting. Thus, if more than one

limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

Forest Productivity and Management

The tables in this section can help forest owners or managers plan the use of soils for wood crops. They show the potential productivity of the soils for wood crops and rate the soils according to the limitations that affect various aspects of forest management.

Forest Productivity

In table 3, the *potential productivity* of merchantable or *common trees* on a soil is expressed as a site index and as a volume number. The *site index* is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that forest managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. More detailed information regarding site index is available in the “National Forestry Manual,” which is available in the local office of the Natural Resources Conservation Service or on the Internet.

The *volume of wood fiber*, a number, is the yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmination of the mean annual increment (CMAI), indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to manage are those that are preferred for planting, seeding, or natural regeneration and those that remain in the stand after thinning or partial harvest.

Forest Management

In table 4, interpretive ratings are given for some aspects of forest management. The ratings are both verbal and numerical.

Some rating class terms indicate the degree to which the soils are suited to a specified forest management practice. *Well suited* indicates that the soil has features that are favorable for the specified practice and has no limitations. Good performance can be expected, and little or no maintenance is needed. *Moderately well suited* indicates that the soil has features that are moderately favorable for the specified practice. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. *Poorly suited* indicates that the soil has one or more properties that are unfavorable for the specified practice. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. *Unsuited* indicates that the expected performance of the soil is unacceptable for the specified practice or that extreme measures are needed to overcome the undesirable soil properties.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified forest management practice (1.00) and the point at which the soil feature is not a limitation (0.00).

The paragraphs that follow indicate the soil properties considered in rating the soils for forest management practices. More detailed information about the criteria used in the ratings is available in the “National Forestry Manual,” which is available in the local office of the Natural Resources Conservation Service or on the Internet.

Ratings in the column *hazard of off-road or off-trail erosion* are based on slope and on soil erodibility factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging,

grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of *slight* indicates that erosion is unlikely under ordinary climatic conditions; *moderate* indicates that some erosion is likely and that erosion-control measures may be needed; *severe* indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and *very severe* indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Ratings in the column *hazard of erosion on roads and trails* are based on the soil erodibility factor K, slope, and content of rock fragments. The ratings apply to unsurfaced roads and trails. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that little or no erosion is likely; *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Ratings in the column *suitability for roads (natural surface)* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage. The ratings indicate the suitability for using the natural surface of the soil for roads. The soils are described as well suited, moderately well suited, or poorly suited to this use.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 5 shows the degree and kind of soil limitations that affect dwellings with and without basements and small commercial buildings.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Slightly limited* indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the

load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Sanitary Facilities

Table 6 shows the degree and kind of soil limitations that affect septic tank absorption fields and sewage lagoons. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Slightly limited* indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic

bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

Construction Materials

Table 7 gives information about the soils as potential sources of reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

The soils are rated *good, fair,* or *poor* as potential sources of reclamation material, roadfill, and topsoil. The features that limit the soils as sources of these materials are specified in the table. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of reclamation material, roadfill, or topsoil. The lower the number, the greater the limitation.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are ascertained by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil features.

Engineering Index Properties

Table 8 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

On the Island of Kahoolawe, some soils have appreciable amounts of highly weathered clays. The suffix “K” was added to the Unified class symbols to identify the soils with kaolinite clay.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical Properties

Table 9 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$- or $^1/_{10}$-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and

management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 9, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Soil Properties

Table 10 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Soil Features

Table 11 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness of the restrictive layer, which significantly affects the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility). See Linear extensibility.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable

according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water. Water filling all the unblocked pores of the material below the water table.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined

outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Iron depletions. Low-chroma zones having a low content of iron and manganese

oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^1/_3$- or $^1/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau)

and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as

"permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed.

These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this report, classes for simple slopes are as follows:

Nearly level	0 to 3 percent
Gently sloping	3 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 30 percent
Steep	30 to 50 percent
Very steep	50 percent and higher

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.—Rainfall and Temperature

(Recorded at Kahoolawe in the period 1990-93)

Month	Average rainfall (inches)	Temperature (degrees F)		
		Average	Maximum	Minimum
January----	3.04	68.3	71.7	64.8
February---	1.67	66.8	70.6	62.9
March------	1.61	67.3	71.4	63.3
April------	0.78	69.5	73.7	65.3
May--------	1.16	70.1	74.2	66.0
June-------	0.78	71.9	75.7	68.2
July-------	2.56	72.6	76.4	68.8
August-----	1.04	73.1	76.6	69.5
September--	1.73	73.5	77.4	69.5
October----	2.85	73.6	77.5	69.7
November---	1.69	72.6	76.1	69.1
December---	3.18	73.0	76.2	69.8
Annual-----	22.09	71.0	74.8	67.2

Table 2.—Acreage and Proportionate Extent of the Soils

Map symbol	Map unit name	Acres	Percent
1	Typic Torriorthents, badland-Typic Haplotorrox-Rock outcrop complex, 10 to 30 percent slopes	5,434	19.1
2	Typic Torriorthents, badland-Typic Torriorthents, eolian, complex, 5 to 25 percent slopes	436	1.5
4	Beaches, 0 to 5 percent slopes	69	0.2
5	Typic Haplotorrox, 5 to 15 percent slopes	357	1.3
6	Typic Haplotorrox, wind polished, 3 to 12 percent slopes	2,400	8.4
7	Typic Haplotorrox, wind polished, 12 to 20 percent slopes	973	3.4
8	Typic Haplotorrox, wind polished-Typic Torriorthents, badland, complex, 3 to 12 percent slopes	479	1.7
9	Typic Torriorthents, eolian, 3 to 15 percent slopes	221	0.8
11	Typic Torriorthents, eolian, 15 to 30 percent slopes	52	0.2
12	Typic Haplotorrerts, extremely stony, 3 to 15 percent slopes	136	0.5
13	Typic Torrifluvents, 0 to 6 percent slopes	62	0.2
14	Typic Haplocambids, moderately deep, 3 to 12 percent slopes	621	2.2
15	Typic Haplocambids, moderately deep-Rock outcrop complex, 5 to 20 percent slopes	2,986	10.5
16	Typic Haplotorrox, windblown, 3 to 12 percent slopes	697	2.4
17	Typic Haplotorrox, windblown, 8 to 20 percent slopes	446	1.6
18	Typic Haplotorrox, black subsoil, 8 to 20 percent slopes, gullied	224	0.8
19	Typic Haplotorrox, windblown, 3 to 8 percent slopes, hummocky	336	1.2
20	Rock outcrop-Lithic Torriorthents complex, 50 to 150 percent slopes	1,126	4.0
21	Rock outcrop-Typic Haplotorrerts complex, 8 to 20 percent slopes	97	0.3
22	Rock outcrop-Typic Haplocambids, moderately deep, complex, 12 to 25 percent slopes	259	0.9
23	Lithic Torriorthents-Rock outcrop complex, 5 to 15 percent slopes	4,574	16.1
24	Lithic Torriorthents-Rock outcrop complex, 15 to 30 percent slopes	2,423	8.5
25	Rock outcrop-Lithic Torriorthents complex, 30 to 50 percent slopes	1,778	6.2
26	Rubble land, 3 to 12 percent slopes	146	0.5
27	Typic Torriorthents, saprolite-Rock outcrop complex, 5 to 20 percent slopes	707	2.5
28	Typic Haplotorrerts, excavated-Urban land complex, 0 to 8 percent slopes	15	*
29	Typic Haplocambids, deep, 3 to 12 percent slopes	1,035	3.6
30	Typic Haplocambids, deep, 8 to 20 percent slopes	37	0.1
31	Typic Haplocambids, deep-Typic Haplocambids, moderately deep, complex, 3 to 8 percent slopes	234	0.8
32	Typic Haplotorrox, dark surface, 3 to 8 percent slopes, severely eroded	111	0.4
	Total	28,471	100.0

* Less than 0.1 percent.

Table 3.—Forest Productivity

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber	
			cu ft/ac	
1:				
Typic Torriorthents, badland	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Rock outcrop.				
2:				
Typic Torriorthents, badland	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Torriorthents, eolian	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Rock outcrop.				
4:				
Beaches	---	---	---	aki aki, pohuehue
Rock outcrop.				
5:				
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox, windblown	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
6:				
Typic Haplotorrox, wind polished	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox, windblown	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Torriorthents, badland	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili

Table 3.—Forest Productivity—Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber	
			cu ft/ac	
7:				
Typic Haplotorrox, wind polished	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox, windblown	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Torriorthents, badland	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
8:				
Typic Haplotorrox, wind polished	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Torriorthents, badland	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox, windblown	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
9:				
Typic Torriorthents, eolian	---	---	---	`A'ali'i, `ilie'e, kawelu, Kulu'i, ma’o, pauohiiaka, pili, wili wili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilie'e, kawelu, Kulu'i, ma’o, pauohiiaka, pili, wili wili
Typic Haplotorrox, dark surface	---	---	---	`A'ali'i, `ilie'e, kawelu, Kulu'i, ma’o, pauohiiaka, pili, wili wili

Table 3.—Forest Productivity—Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber	
			cu ft/ac	
11:				
Typic Torriorthents, eolian	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Rock outcrop.				
12:				
Typic Haplotorrerts	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, pili
Typic Haplocambids, deep	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Maui chaff flower, pili
Rock outcrop.				
Typic Torrifluvents	---	---	---	`A'ali'i, `ilima, `uhaloa, aki aki, Aweoweo, pili, pohuehue
13:				
Typic Torrifluvents	---	---	---	`A'ali'i, `ilima, `uhaloa, aki aki, Aweoweo, pili, pohuehue
Beaches	---	---	---	aki aki, pohuehue
14:				
Typic Haplocambids, moderately deep	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, Kulu'i, pili, wili wili
Lithic Torriorthents, extremely stony	---	---	---	`ilie'e, `ilima, `uhaloa, kawelu, pauohiiaka, pili
Typic Haplocambids, deep	---	---	---	`A'ali'i, `ilie'e, kawelu, Kulu'i, ma’o, pauohiiaka, pili, wili wili
Rock outcrop.				

Table 3.—Forest Productivity—Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber	
			cu ft/ac	
15:				
Typic Haplocambids, moderately deep	---	---	---	`ilima, `uhaloa, Aweoweo, ma'o, Maui chaff flower, pili
Rock outcrop.				
Typic Haplocambids, deep	---	---	---	`ilima, `uhaloa, Aweoweo, kawelu, ma'o, Maui chaff flower, pili
16:				
Typic Haplotorrox, windblown	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
17:				
Typic Haplotorrox, windblown	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
18:				
Typic Haplotorrox, black subsoil	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
19:				
Typic Haplotorrox, windblown	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
20:				
Rock outcrop.				
Lithic Torriorthents	---	---	---	---

Table 3.—Forest Productivity—Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber	
			cu ft/ac	
21:				
Rock outcrop.				
Typic Haplotorrerts-----	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, pili
Typic Haplocambids, deep, very stony-------	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Maui chaff flower, pili
22:				
Rock outcrop.				
Typic Haplocambids, moderately deep--------	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, ma'o, Maui chaff flower, pili, wili wili
23:				
Lithic Torriorthents----	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Maui chaff flower, pili
Rock outcrop.				
24:				
Lithic Torriorthents----	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Maui chaff flower, pili
Rock outcrop.				
25:				
Rock outcrop.				
Lithic Torriorthents----	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Maui chaff flower, pili
26:				
Rubble land-------------	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, ma'o, Maui chaff flower
Typic Haplotorrerts-----	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, pili

Table 3.—Forest Productivity—Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber	
			cu ft/ac	
27:				
Typic Torriorthents, saprolite	---	---	---	`A'ali'i, `ilima, `uhaloa, pili
Rock outcrop.				
Typic Haplotorrox, wind polished	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
28:				
Typic Haplotorrerts, excavated	---	---	---	---
Urban land.				
29:				
Typic Haplocambids, deep	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Kulu'i, Maui chaff flower, pili, wili wili
Typic Haplocambids, moderately deep	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Maui chaff flower, pili
Rock outcrop.				
30:				
Typic Haplocambids, deep	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Maui chaff flower, pili
Typic Haplocambids, moderately deep	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Maui chaff flower, pili
Rock outcrop.				
31:				
Typic Haplocambids, deep	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Kulu'i, Maui chaff flower, pili, wili wili

Table 3.—Forest Productivity—Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber	
			cu ft/ac	
31:				
Typic Haplocambids, moderately deep	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, kawelu, Kulu'i, Maui chaff flower, pili, wili wili
Rock outcrop.				
32:				
Typic Haplotorrox, dark surface	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili
Typic Haplotorrox, black subsoil	---	---	---	`A'ali'i, `ilima, `uhaloa, Aweoweo, pili

Table 4.—Forest Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1:							
Typic Torriorthents, badland	40	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Low strength	0.50
Typic Haplotorrox	35	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
Rock outcrop	25	Not rated		Not rated		Not rated	
2:							
Typic Torriorthents, badland	50	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Torriorthents, eolian	30	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplotorrox	10	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
Rock outcrop	10	Not rated		Not rated		Not rated	
4:							
Beaches	95	Not rated		Not rated		Not rated	
Rock outcrop	5	Not rated		Not rated		Not rated	
5:							
Typic Haplotorrox	90	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
Typic Haplotorrox, windblown	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
6:							
Typic Haplotorrox, wind polished	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
						Slope	0.50
Typic Haplotorrox, windblown	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50

Table 4.—Forest Management—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
6:							
Typic Torriorthents, badland	10	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Low strength	0.50
7:							
Typic Haplotorrox, wind polished	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplotorrox, windblown	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Torriorthents, badland	10	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Low strength	0.50
8:							
Typic Haplotorrox, wind polished	40	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Torriorthents, badland	40	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplotorrox	10	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
Typic Haplotorrox, windblown	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
9:							
Typic Torriorthents, eolian	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplotorrox	15	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
Typic Haplotorrox, dark surface	5	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50

Table 4.—Forest Management—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
11:							
Typic Torriorthents, eolian	80	Moderate		Severe		Poorly suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	1.00
						Low strength	0.50
Typic Haplotorrox	15	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
Rock outcrop	5	Not rated		Not rated		Not rated	
12:							
Typic Haplotorrerts	80	Slight		Severe		Moderately suited	
				Slope/erodibility	0.95	Slope	0.50
						Stickiness; high plasticity index	0.50
						Low strength	0.50
Typic Haplocambids, deep	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Rock outcrop	5	Not rated		Not rated		Not rated	
Typic Torrifluvents	5	Slight		Slight		Poorly suited	
						Flooding	1.00
						Low strength	0.50
13:							
Typic Torrifluvents	85	Slight		Slight		Poorly suited	
						Ponding	1.00
						Flooding	1.00
						Low strength	0.50
Beaches	15	Not rated		Not rated		Not rated	
14:							
Typic Haplocambids, moderately deep	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Lithic Torriorthents, extremely stony	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Typic Haplocambids, deep	5	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Rock outcrop	5	Not rated		Not rated		Not rated	
15:							
Typic Haplocambids, moderately deep	60	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50

Table 4.—Forest Management—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
15:							
Rock outcrop--------	30	Not rated		Not rated		Not rated	
Typic Haplocambids, deep----------	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
16:							
Typic Haplotorrox, windblown----------	90	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplotorrox---	10	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
17:							
Typic Haplotorrox, windblown----------	90	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplotorrox---	10	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
18:							
Typic Haplotorrox, black subsoil------	85	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplotorrox---	15	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
19:							
Typic Haplotorrox, windblown----------	85	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplotorrox---	15	Moderate		Severe		Moderately suited	
		Slope/erodibility	0.50	Slope/erodibility	0.95	Slope	0.50
						Low strength	0.50
20:							
Rock outcrop--------	80	Not rated		Not rated		Not rated	
Lithic Torriorthents------	20	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50

Table 4.—Forest Management—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
21:							
Rock outcrop--------	60	Not rated		Not rated		Not rated	
Typic Haplotorrerts-	35	Slight		Severe		Moderately suited	
				Slope/erodibility	0.95	Slope	0.50
						Stickiness; high plasticity index	0.50
						Low strength	0.50
Typic Haplocambids, deep, very stony---	5	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
22:							
Rock outcrop--------	55	Not rated		Not rated		Not rated	
Typic Haplocambids, moderately deep----	45	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
23:							
Lithic Torriorthents------	70	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Rock outcrop--------	30	Not rated		Not rated		Not rated	
24:							
Lithic Torriorthents------	55	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Rock outcrop--------	45	Not rated		Not rated		Not rated	
25:							
Rock outcrop--------	60	Not rated		Not rated		Not rated	
Lithic Torriorthents------	40	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
26:							
Rubble land---------	85	Not rated		Not rated		Not rated	
Typic Haplotorrerts-	15	Slight		Severe		Moderately suited	
				Slope/erodibility	0.95	Slope	0.50
						Stickiness; high plasticity index	0.50
						Low strength	0.50

Table 4.—Forest Management—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
27:							
Typic Torriorthents, saprolite	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Rock outcrop	20	Not rated		Not rated		Not rated	
Typic Haplotorrox, wind polished	10	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
						Slope	0.50
28:							
Typic Haplotorrerts, excavated	80	Slight		Severe		Moderately suited	
				Slope/erodibility	0.95	Slope	0.50
						Stickiness; high plasticity index	0.50
						Low strength	0.50
Urban land	20	Not rated		Not rated		Not rated	
29:							
Typic Haplocambids, deep	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Typic Haplocambids, moderately deep	15	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Rock outcrop	5	Not rated		Not rated		Not rated	
30:							
Typic Haplocambids, deep	80	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Typic Haplocambids, moderately deep	15	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Rock outcrop	5	Not rated		Not rated		Not rated	
31:							
Typic Haplocambids, deep	55	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Low strength	0.50
Typic Haplocambids, moderately deep	40	Slight		Moderate		Moderately suited	
				Slope/erodibility	0.50	Slope	0.50
						Low strength	0.50
Rock outcrop	5	Not rated		Not rated		Not rated	

Table 4.—Forest Management—Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
32:							
Typic Haplotorrox, dark surface-------	85	Slight		Moderate Slope/erodibility	 0.50	Moderately suited Low strength	 0.50
Typic Haplotorrox, black subsoil------	15	Slight		Moderate Slope/erodibility	 0.50	Moderately suited Slope Low strength	 0.50 0.50

Table 5.—Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1:							
Typic Torriorthents, badland	40	Very limited Too steep	 1.00	Very limited Too steep	 1.00	Very limited Slope	 1.00
Typic Haplotorrox	35	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Rock outcrop	25	Not rated		Not rated		Not rated	
2:							
Typic Torriorthents, badland	50	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Torriorthents, eolian	30	Somewhat limited Slope	 0.63	Somewhat limited Slope	 0.63	Very limited Slope	 1.00
Typic Haplotorrox	10	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Rock outcrop	10	Not rated		Not rated		Not rated	
4:							
Beaches	95	Very limited Flooding	 1.00	Very limited Flooding	 1.00	Very limited Flooding Slope	 1.00 1.00
Rock outcrop	5	Not rated		Not rated		Not rated	
5:							
Typic Haplotorrox	90	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox, windblown	10	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
6:							
Typic Haplotorrox, wind polished	80	Not limited		Not limited		Somewhat limited Slope	 0.50
Typic Haplotorrox, windblown	10	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Torriorthents, badland	10	Very limited Too steep	 1.00	Very limited Too steep	 1.00	Very limited Slope	 1.00

Table 5.—Building Site Development—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
7:							
Typic Haplotorrox, wind polished	80	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox, windblown	10	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Torriorthents, badland	10	Very limited Too steep	 1.00	Very limited Too steep	 1.00	Very limited Slope	 1.00
8:							
Typic Haplotorrox, wind polished	40	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Torriorthents, badland	40	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox	10	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox, windblown	10	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
9:							
Typic Torriorthents, eolian	80	Somewhat limited Slope	 0.63	Somewhat limited Slope	 0.63	Very limited Slope	 1.00
Typic Haplotorrox	15	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox, dark surface	5	Not limited		Not limited		Somewhat limited Slope	 0.12
11:							
Typic Torriorthents, eolian	80	Very limited Too steep	 1.00	Very limited Too steep	 1.00	Very limited Slope	 1.00
Typic Haplotorrox	15	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Rock outcrop	5	Not rated		Not rated		Not rated	
12:							
Typic Haplotorrerts	80	Very limited Shrink-swell Large stones Slope	 1.00 0.98 0.16	Very limited Shrink-swell Large stones Slope	 1.00 0.98 0.16	Very limited Shrink-swell Slope Large stones	 1.00 1.00 0.98

Table 5.—Building Site Development—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
12:							
Typic Haplocambids, deep	10	Not limited		Somewhat limited		Somewhat limited	
				Depth to hard bedrock	0.42	Slope	0.12
Rock outcrop	5	Not rated		Not rated		Not rated	
Typic Torrifluvents-	5	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Shrink-swell	0.50			Shrink-swell	0.50
13:							
Typic Torrifluvents-	85	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
		Ponding	1.00	Ponding	1.00	Ponding	1.00
		Shrink-swell	0.50			Shrink-swell	0.50
Beaches	15	Very limited		Very limited		Very limited	
		Flooding	1.00	Flooding	1.00	Flooding	1.00
						Slope	1.00
14:							
Typic Haplocambids, moderately deep	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to hard bedrock	0.38	Depth to hard bedrock	1.00	Slope	0.12
		Large stones	0.03	Large stones	0.03	Depth to hard bedrock	0.38
						Large stones	0.03
Lithic Torriorthents, extremely stony	10	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
						Slope	0.12
Typic Haplocambids, deep	5	Not limited		Somewhat limited		Somewhat limited	
				Depth to hard bedrock	0.42	Slope	0.12
Rock outcrop	5	Not rated		Not rated		Not rated	
15:							
Typic Haplocambids, moderately deep	60	Somewhat limited		Very limited		Very limited	
		Slope	0.37	Depth to hard bedrock	1.00	Slope	1.00
		Depth to hard bedrock	0.38	Slope	0.37	Depth to hard bedrock	0.38
		Large stones	0.03	Large stones	0.03	Large stones	0.03
Rock outcrop	30	Not rated		Not rated		Not rated	
Typic Haplocambids, deep	10	Not limited		Somewhat limited		Somewhat limited	
				Depth to hard bedrock	0.42	Slope	0.12

Table 5.—Building Site Development—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
16:							
Typic Haplotorrox, windblown	90	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox	10	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
17:							
Typic Haplotorrox, windblown	90	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox	10	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
18:							
Typic Haplotorrox, black subsoil	85	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox	15	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
19:							
Typic Haplotorrox, windblown	85	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
Typic Haplotorrox	15	Somewhat limited Slope	 0.37	Somewhat limited Slope	 0.37	Very limited Slope	 1.00
20:							
Rock outcrop	80	Not rated		Not rated		Not rated	
Lithic Torriorthents	20	Very limited Depth to hard bedrock	 1.00	Very limited Depth to hard bedrock	 1.00	Very limited Depth to hard bedrock Slope	 1.00 0.12
21:							
Rock outcrop	60	Not rated		Not rated		Not rated	
Typic Haplotorrerts	35	Very limited Shrink-swell Large stones Slope	 1.00 0.98 0.16	Very limited Shrink-swell Large stones Slope	 1.00 0.98 0.16	Very limited Shrink-swell Slope Large stones	 1.00 1.00 0.98
Typic Haplocambids, deep, very stony	5	Not limited		Somewhat limited Depth to hard bedrock	 0.42	Somewhat limited Slope	 0.12
22:							
Rock outcrop	55	Not rated		Not rated		Not rated	

Table 5.—Building Site Development—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
22:							
Typic Haplocambids, moderately deep	45	Somewhat limited		Very limited		Very limited	
		Slope	0.37	Depth to hard bedrock	1.00	Slope	1.00
		Depth to hard bedrock	0.38	Slope	0.37	Depth to hard bedrock	0.38
		Large stones	0.03	Large stones	0.03	Large stones	0.03
23:							
Lithic Torriorthents	70	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
						Slope	0.12
Rock outcrop	30	Not rated		Not rated		Not rated	
24:							
Lithic Torriorthents	55	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
						Slope	0.12
Rock outcrop	45	Not rated		Not rated		Not rated	
25:							
Rock outcrop	60	Not rated		Not rated		Not rated	
Lithic Torriorthents	40	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Depth to hard bedrock	1.00
						Slope	0.12
26:							
Rubble land	85	Very limited		Very limited		Very limited	
		Large stones	1.00	Large stones	1.00	Large stones	1.00
		Too steep	1.00	Too steep	1.00	Slope	1.00
Typic Haplotorrerts	15	Very limited		Very limited		Very limited	
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
		Large stones	0.98	Large stones	0.98	Slope	1.00
		Slope	0.16	Slope	0.16	Large stones	0.98
27:							
Typic Torriorthents, saprolite	80	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.37	Slope	0.37	Slope	1.00
Rock outcrop	20	Not rated		Not rated		Not rated	

Table 5.—Building Site Development—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
28:							
Typic Haplotorrerts, excavated	80	Very limited		Very limited		Very limited	
		Shrink-swell	1.00	Shrink-swell	1.00	Shrink-swell	1.00
		Large stones	0.98	Large stones	0.98	Slope	1.00
		Slope	0.16	Slope	0.16	Large stones	0.98
Urban land	20	Not rated		Not rated		Not rated	
29:							
Typic Haplocambids, deep	80	Not limited		Somewhat limited		Somewhat limited	
				Depth to hard bedrock	0.42	Slope	0.12
Typic Haplocambids, moderately deep	15	Somewhat limited		Very limited		Somewhat limited	
		Depth to hard bedrock	0.38	Depth to hard bedrock	1.00	Slope	0.12
		Large stones	0.03	Large stones	0.03	Depth to hard bedrock	0.38
						Large stones	0.03
Rock outcrop	5	Not rated		Not rated		Not rated	
30:							
Typic Haplocambids, deep	80	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.37	Slope	0.37	Slope	1.00
				Depth to hard bedrock	0.42		
Typic Haplocambids, moderately deep	15	Somewhat limited		Very limited		Somewhat limited	
		Depth to hard bedrock	0.38	Depth to hard bedrock	1.00	Slope	0.12
		Large stones	0.03	Large stones	0.03	Depth to hard bedrock	0.38
						Large stones	0.03
Rock outcrop	5	Not rated		Not rated		Not rated	
31:							
Typic Haplocambids, deep	55	Not limited		Somewhat limited		Somewhat limited	
				Depth to hard bedrock	0.42	Slope	0.12
Typic Haplocambids, moderately deep	40	Somewhat limited		Very limited		Very limited	
		Slope	0.37	Depth to hard bedrock	1.00	Slope	1.00
		Depth to hard bedrock	0.38	Slope	0.37	Depth to hard bedrock	0.38
		Large stones	0.03	Large stones	0.03	Large stones	0.03
Rock outcrop	5	Not rated		Not rated		Not rated	
32:							
Typic Haplotorrox, dark surface	85	Not limited		Not limited		Somewhat limited	
						Slope	0.12

Table 5.—Building Site Development—Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
32: Typic Haplotorrox, black subsoil------	15	Somewhat limited Slope	0.37	Somewhat limited Slope	0.37	Very limited Slope	1.00

Table 6.—Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
1:					
Typic Torriorthents, badland	40	Very limited		Very limited	
		Too steep	1.00	Slope	1.00
		Slow water movement	0.82	Seepage	0.18
Typic Haplotorrox	35	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
Rock outcrop	25	Not rated		Not rated	
2:					
Typic Torriorthents, badland	50	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.18
Typic Torriorthents, eolian	30	Somewhat limited		Very limited	
		Slope	0.63	Slope	1.00
		Slow water movement	0.50	Seepage	0.50
Typic Haplotorrox	10	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
Rock outcrop	10	Not rated		Not rated	
4:					
Beaches	95	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Slope	1.00
		Flooding	0.40	Flooding	0.40
Rock outcrop	5	Not rated		Not rated	
5:					
Typic Haplotorrox	90	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Haplotorrox, windblown	10	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
6:					
Typic Haplotorrox, wind polished	80	Somewhat limited		Somewhat limited	
		Slow water movement	0.82	Slope	0.92
				Seepage	0.50

Table 6.—Sanitary Facilities—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
6:					
Typic Haplotorrox, windblown----------	10	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Torriorthents, badland----------	10	Very limited		Very limited	
		Too steep	1.00	Slope	1.00
		Slow water movement	0.82	Seepage	0.18
7:					
Typic Haplotorrox, wind polished------	80	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Haplotorrox, windblown----------	10	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Torriorthents, badland----------	10	Very limited		Very limited	
		Too steep	1.00	Slope	1.00
		Slow water movement	0.82	Seepage	0.18
8:					
Typic Haplotorrox, wind polished------	40	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Torriorthents, badland----------	40	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.18
Typic Haplotorrox---	10	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Haplotorrox, windblown----------	10	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
9:					
Typic Torriorthents, eolian-----------	80	Somewhat limited		Very limited	
		Slope	0.63	Slope	1.00
		Slow water movement	0.50	Seepage	0.50

Table 6.—Sanitary Facilities—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
9:					
Typic Haplotorrox---	15	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Haplotorrox, dark surface-------	5	Very limited		Somewhat limited	
		Slow water movement	1.00	Slope	0.68
11:					
Typic Torriorthents, eolian----------	80	Very limited		Very limited	
		Too steep	1.00	Slope	1.00
		Slow water movement	0.50	Seepage	0.50
Typic Haplotorrox---	15	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
Rock outcrop--------	5	Not rated		Not rated	
12:					
Typic Haplotorrerts-	80	Very limited		Very limited	
		Slow water movement	1.00	Large stones	1.00
		Large stones	0.98	Slope	1.00
		Slope	0.16		
Typic Haplocambids, deep----------	10	Somewhat limited		Very limited	
		Moderate depth to bedrock	0.77	Seepage	1.00
				Slope	0.68
				Large stones	0.35
				Depth to hard bedrock	0.42
Rock outcrop--------	5	Not rated		Not rated	
Typic Torrifluvents-	5	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Slow water movement	0.82	Seepage	1.00
13:					
Typic Torrifluvents-	85	Very limited		Very limited	
		Flooding	1.00	Flooding	1.00
		Slow water movement	0.82	Seepage	1.00
Beaches----------	15	Very limited		Very limited	
		Filtering capacity	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Slope	1.00
		Flooding	0.40	Flooding	0.40
14:					
Typic Haplocambids, moderately deep----	80	Very limited		Very limited	
		Shallow depth to bedrock	1.00	Depth to hard bedrock	1.00
		Large stones	0.03	Seepage	1.00
				Large stones	0.82
				Slope	0.68

Table 6.—Sanitary Facilities—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
14:					
Lithic Torriorthents, extremely stony----	10	Not limited		Very limited	
				Depth to hard bedrock	1.00
				Seepage	1.00
				Slope	0.68
				Large stones	0.34
Typic Haplocambids, deep----------	5	Somewhat limited		Very limited	
		Moderate depth to bedrock	0.77	Seepage	1.00
				Slope	0.68
				Large stones	0.35
				Depth to hard bedrock	0.42
Rock outcrop--------	5	Not rated		Not rated	
15:					
Typic Haplocambids, moderately deep----	60	Very limited		Very limited	
		Shallow depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.37	Slope	1.00
		Large stones	0.03	Seepage	1.00
				Large stones	0.82
Rock outcrop--------	30	Not rated		Not rated	
Typic Haplocambids, deep----------	10	Somewhat limited		Very limited	
		Moderate depth to bedrock	0.77	Seepage	1.00
				Slope	0.68
				Large stones	0.35
				Depth to hard bedrock	0.42
16:					
Typic Haplotorrox, windblown----------	90	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Haplotorrox---	10	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
17:					
Typic Haplotorrox, windblown----------	90	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Haplotorrox---	10	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50

Table 6.—Sanitary Facilities—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
18:					
Typic Haplotorrox, black subsoil------	85	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Haplotorrox---	15	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
19:					
Typic Haplotorrox, windblown----------	85	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50
Typic Haplotorrox---	15	Somewhat limited		Very limited	
		Slow water movement	0.50	Slope	1.00
		Slope	0.37	Seepage	0.50
20:					
Rock outcrop--------	80	Not rated		Not rated	
Lithic Torriorthents------	20	Not limited		Very limited	
				Depth to hard bedrock	1.00
				Seepage	1.00
				Slope	0.68
				Large stones	0.34
21:					
Rock outcrop--------	60	Not rated		Not rated	
Typic Haplotorrerts-	35	Very limited		Very limited	
		Slow water movement	1.00	Large stones	1.00
		Large stones	0.98	Slope	1.00
		Slope	0.16		
Typic Haplocambids, deep, very stony---	5	Somewhat limited		Very limited	
		Moderate depth to bedrock	0.77	Seepage	1.00
				Slope	0.68
				Large stones	0.35
				Depth to hard bedrock	0.42
22:					
Rock outcrop--------	55	Not rated		Not rated	
Typic Haplocambids, moderately deep----	45	Very limited		Very limited	
		Shallow depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.37	Slope	1.00
		Large stones	0.03	Seepage	1.00
				Large stones	0.82

Table 6.—Sanitary Facilities—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
23:					
Lithic Torriorthents------	70	Not limited		Very limited	
				Depth to hard bedrock	1.00
				Seepage	1.00
				Slope	0.68
				Large stones	0.34
Rock outcrop--------	30	Not rated		Not rated	
24:					
Lithic Torriorthents------	55	Not limited		Very limited	
				Depth to hard bedrock	1.00
				Seepage	1.00
				Slope	0.68
				Large stones	0.34
Rock outcrop--------	45	Not rated		Not rated	
25:					
Rock outcrop--------	60	Not rated		Not rated	
Lithic Torriorthents------	40	Not limited		Very limited	
				Depth to hard bedrock	1.00
				Seepage	1.00
				Slope	0.68
				Large stones	0.34
26:					
Rubble land---------	85	Very limited		Very limited	
		Filtering capacity	1.00	Large stones	1.00
		Large stones	1.00	Seepage	1.00
		Seepage, bottom layer	1.00	Slope	1.00
		Too steep	1.00		
Typic Haplotorrerts-	15	Very limited		Very limited	
		Slow water movement	1.00	Large stones	1.00
		Large stones	0.98	Slope	1.00
		Slope	0.16		
27:					
Typic Torriorthents, saprolite----------	80	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.18
Rock outcrop--------	20	Not rated		Not rated	

Table 6.—Sanitary Facilities—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
28:					
Typic Haplotorrerts, excavated	80	Very limited		Very limited	
		Slow water movement	1.00	Large stones	1.00
		Large stones	0.98	Slope	1.00
		Slope	0.16		
Urban land	20	Not rated		Not rated	
29:					
Typic Haplocambids, deep	80	Somewhat limited		Very limited	
		Moderate depth to bedrock	0.77	Seepage	1.00
				Slope	0.68
				Large stones	0.35
				Depth to hard bedrock	0.42
Typic Haplocambids, moderately deep	15	Very limited		Very limited	
		Shallow depth to bedrock	1.00	Depth to hard bedrock	1.00
		Large stones	0.03	Seepage	1.00
				Large stones	0.82
				Slope	0.68
Rock outcrop	5	Not rated		Not rated	
30:					
Typic Haplocambids, deep	80	Somewhat limited		Very limited	
		Moderate depth to bedrock	0.77	Slope	1.00
		Slope	0.37	Seepage	1.00
				Large stones	0.35
				Depth to hard bedrock	0.42
Typic Haplocambids, moderately deep	15	Very limited		Very limited	
		Shallow depth to bedrock	1.00	Depth to hard bedrock	1.00
		Large stones	0.03	Seepage	1.00
				Large stones	0.82
				Slope	0.68
Rock outcrop	5	Not rated		Not rated	
31:					
Typic Haplocambids, deep	55	Somewhat limited		Very limited	
		Moderate depth to bedrock	0.77	Seepage	1.00
				Slope	0.68
				Large stones	0.35
				Depth to hard bedrock	0.42

Table 6.—Sanitary Facilities—Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
31:					
Typic Haplocambids, moderately deep----	40	Very limited		Very limited	
		Shallow depth to bedrock	1.00	Depth to hard bedrock	1.00
		Slope	0.37	Slope	1.00
		Large stones	0.03	Seepage	1.00
				Large stones	0.82
Rock outcrop--------	5	Not rated		Not rated	
32:					
Typic Haplotorrox, dark surface-------	85	Very limited		Somewhat limited	
		Slow water movement	1.00	Slope	0.68
Typic Haplotorrox, black subsoil------	15	Somewhat limited		Very limited	
		Slow water movement	0.82	Slope	1.00
		Slope	0.37	Seepage	0.50

Table 7.—Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
1:							
Typic Torriorthents, badland	40	Not rated		Poor		Not rated	
				Low strength	0.00		
				Slope	0.50		
Typic Haplotorrox	35	Not rated		Poor		Not rated	
				Low strength	0.00		
Rock outcrop	25	Not rated		Not rated		Not rated	
2:							
Typic Torriorthents, badland	50	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Torriorthents, eolian	30	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Haplotorrox	10	Not rated		Poor		Not rated	
				Low strength	0.00		
Rock outcrop	10	Not rated		Not rated		Not rated	
4:							
Beaches	95	Not rated		Good		Not rated	
Rock outcrop	5	Not rated		Not rated		Not rated	
5:							
Typic Haplotorrox	90	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Haplotorrox, windblown	10	Not rated		Poor		Not rated	
				Low strength	0.00		
6:							
Typic Haplotorrox, wind polished	80	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Haplotorrox, windblown	10	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Torriorthents, badland	10	Not rated		Poor		Not rated	
				Low strength	0.00		
				Slope	0.50		

Table 7.—Construction Materials—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
7:							
Typic Haplotorrox, wind polished	80	Not rated		Poor Low strength	 0.00	Not rated	
Typic Haplotorrox, windblown	10	Not rated		Poor Low strength	 0.00	Not rated	
Typic Torriorthents, badland	10	Not rated		Poor Low strength Slope	 0.00 0.50	Not rated	
8:							
Typic Haplotorrox, wind polished	40	Not rated		Poor Low strength	 0.00	Not rated	
Typic Torriorthents, badland	40	Not rated		Poor Low strength	 0.00	Not rated	
Typic Haplotorrox	10	Not rated		Poor Low strength	 0.00	Not rated	
Typic Haplotorrox, windblown	10	Not rated		Poor Low strength	 0.00	Not rated	
9:							
Typic Torriorthents, eolian	80	Not rated		Poor Low strength	 0.00	Not rated	
Typic Haplotorrox	15	Not rated		Poor Low strength	 0.00	Not rated	
Typic Haplotorrox, dark surface	5	Not rated		Poor Low strength	 0.00	Not rated	
11:							
Typic Torriorthents, eolian	80	Not rated		Poor Low strength Slope	 0.00 0.18	Not rated	
Typic Haplotorrox	15	Not rated		Poor Low strength	 0.00	Not rated	
Rock outcrop	5	Not rated		Not rated		Not rated	
12:							
Typic Haplotorrerts	80	Not rated		Poor Low strength Stones Shrink-swell Cobble content	 0.00 0.00 0.12 0.88	Not rated	

Table 7.—Construction Materials—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
12:							
Typic Haplocambids, deep	10	Not rated		Fair		Not rated	
				Stones	0.43		
				Low strength	0.22		
				Depth to bedrock	0.58		
Rock outcrop	5	Not rated		Not rated		Not rated	
Typic Torrifluvents-	5	Not rated		Fair		Not rated	
				Shrink-swell	0.99		
13:							
Typic Torrifluvents-	85	Not rated		Fair		Not rated	
				Shrink-swell	0.99		
Beaches	15	Not rated		Good		Not rated	
14:							
Typic Haplocambids, moderately deep	80	Not rated		Poor		Not rated	
				Depth to bedrock	0.00		
				Stones	0.00		
				Low strength	0.22		
Lithic Torriorthents, extremely stony	10	Not rated		Poor		Not rated	
				Stones	0.00		
				Low strength	0.22		
Typic Haplocambids, deep	5	Not rated		Fair		Not rated	
				Stones	0.43		
				Low strength	0.22		
				Depth to bedrock	0.58		
Rock outcrop	5	Not rated		Not rated		Not rated	
15:							
Typic Haplocambids, moderately deep	60	Not rated		Poor		Not rated	
				Depth to bedrock	0.00		
				Stones	0.00		
				Low strength	0.22		
Rock outcrop	30	Not rated		Not rated		Not rated	
Typic Haplocambids, deep	10	Not rated		Fair		Not rated	
				Stones	0.43		
				Low strength	0.22		
				Depth to bedrock	0.58		
16:							
Typic Haplotorrox, windblown	90	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Haplotorrox	10	Not rated		Poor		Not rated	
				Low strength	0.00		

Table 7.—Construction Materials—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
17:							
Typic Haplotorrox, windblown	90	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Haplotorrox	10	Not rated		Poor		Not rated	
				Low strength	0.00		
18:							
Typic Haplotorrox, black subsoil	85	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Haplotorrox	15	Not rated		Poor		Not rated	
				Low strength	0.00		
19:							
Typic Haplotorrox, windblown	85	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Haplotorrox	15	Not rated		Poor		Not rated	
				Low strength	0.00		
20:							
Rock outcrop	80	Not rated		Not rated		Not rated	
Lithic Torriorthents	20	Not rated		Poor		Not rated	
				Stones	0.00		
				Low strength	0.22		
21:							
Rock outcrop	60	Not rated		Not rated		Not rated	
Typic Haplotorrerts	35	Not rated		Poor		Not rated	
				Low strength	0.00		
				Stones	0.00		
				Shrink-swell	0.12		
				Cobble content	0.88		
Typic Haplocambids, deep, very stony	5	Not rated		Fair		Not rated	
				Stones	0.43		
				Low strength	0.22		
				Depth to bedrock	0.58		
22:							
Rock outcrop	55	Not rated		Not rated		Not rated	
Typic Haplocambids, moderately deep	45	Not rated		Poor		Not rated	
				Depth to bedrock	0.00		
				Stones	0.00		
				Low strength	0.22		

Table 7.—Construction Materials—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
23:							
Lithic Torriorthents	70	Not rated		Poor		Not rated	
				Stones	0.00		
				Low strength	0.22		
Rock outcrop	30	Not rated		Not rated		Not rated	
24:							
Lithic Torriorthents	55	Not rated		Poor		Not rated	
				Stones	0.00		
				Low strength	0.22		
Rock outcrop	45	Not rated		Not rated		Not rated	
25:							
Rock outcrop	60	Not rated		Not rated		Not rated	
Lithic Torriorthents	40	Not rated		Poor		Not rated	
				Stones	0.00		
				Low strength	0.22		
26:							
Rubble land	85	Not rated		Not rated		Not rated	
Typic Haplotorrerts	15	Not rated		Poor		Not rated	
				Low strength	0.00		
				Stones	0.00		
				Shrink-swell	0.12		
				Cobble content	0.88		
27:							
Typic Torriorthents, saprolite	80	Not rated		Poor		Not rated	
				Low strength	0.00		
Rock outcrop	20	Not rated		Not rated		Not rated	
28:							
Typic Haplotorrerts, excavated	80	Not rated		Poor		Not rated	
				Low strength	0.00		
				Stones	0.00		
				Shrink-swell	0.12		
				Cobble content	0.88		
Urban land	20	Not rated		Not rated		Not rated	
29:							
Typic Haplocambids, deep	80	Not rated		Fair		Not rated	
				Stones	0.43		
				Low strength	0.22		
				Depth to bedrock	0.58		

Table 7.—Construction Materials—Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material		Potential source of roadfill		Potential source of topsoil	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
29:							
Typic Haplocambids, moderately deep	15	Not rated		Poor		Not rated	
				Depth to bedrock	0.00		
				Stones	0.00		
				Low strength	0.22		
Rock outcrop	5	Not rated		Not rated		Not rated	
30:							
Typic Haplocambids, deep	80	Not rated		Fair		Not rated	
				Stones	0.43		
				Low strength	0.22		
				Depth to bedrock	0.58		
Typic Haplocambids, moderately deep	15	Not rated		Poor		Not rated	
				Depth to bedrock	0.00		
				Stones	0.00		
				Low strength	0.22		
Rock outcrop	5	Not rated		Not rated		Not rated	
31:							
Typic Haplocambids, deep	55	Not rated		Fair		Not rated	
				Stones	0.43		
				Low strength	0.22		
				Depth to bedrock	0.58		
Typic Haplocambids, moderately deep	40	Not rated		Poor		Not rated	
				Depth to bedrock	0.00		
				Stones	0.00		
				Low strength	0.22		
Rock outcrop	5	Not rated		Not rated		Not rated	
32:							
Typic Haplotorrox, dark surface	85	Not rated		Poor		Not rated	
				Low strength	0.00		
Typic Haplotorrox, black subsoil	15	Not rated		Poor		Not rated	
				Low strength	0.00		

Table 8.—Engineering Index Properties

(Absence of an entry indicates that the data were not estimated. An asterisk denotes the representative texture)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
1:												
Typic Torriorthents, badland--------	0-60	*Stony silty clay loam	*ML-K (proposed)	*A-7	0-10	5-10	100	95-100	95-100	85-95	40-50	10-20
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
Rock outcrop.												
2:												
Typic Torriorthents, badland--------	0-60	*Stony silty clay loam	*ML-K (proposed)	*A-7	0-10	5-10	100	95-100	95-100	85-95	40-50	10-20
Typic Torriorthents, eolian---------	0-9	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	9-60	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
2: Rock outcrop.												
4: Beaches---	0-13	*Sand	*SP-SM	*A-3, A-2	0-15	0-10	95-100	90-100	50-70	5-15	0-14	NP-2
	13-60	*Sand, loamy fine sand, loamy sand	*SP-SM	*A-3, A-2	0-15	0-10	95-100	90-100	50-80	5-15	0-14	NP-2
Rock outcrop.												
5: Typic Haplotorrox---	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
Typic Haplotorrox, windblown---	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20
6: Typic Haplotorrox, wind polished--	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	90-100	85-95	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	90-100	85-95	80-95	75-85	55-60	15-25
	32-60	*Silty clay loam	*ML-K (proposed)	*A-7	0	30-45	70-80	65-75	60-75	60-65	40-50	10-20

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
6:												
Typic Haplotorrox, windblown------	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20
Typic Torriorthents, badland--------	0-60	*Stony silty clay loam	*ML-K (proposed)	*A-7	0-10	5-10	100	95-100	95-100	85-95	40-50	10-20
Typic Haplotorrox, wind polished--	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	90-100	85-95	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	90-100	85-95	80-95	75-85	55-60	15-25
	32-60	*Silty clay loam	*ML-K (proposed)	*A-7	0	30-45	70-80	65-75	60-75	60-65	40-50	10-20
7:												
Typic Haplotorrox, wind polished--	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silty clay loam	*MH-K (proposed)	*A-7	0	2	100	95-100	90-100	85-95	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	2	90-100	85-95	80-95	75-85	55-60	15-25
	32-60	*Silty clay loam	*ML-K (proposed)	*A-7	0	30-45	70-80	65-75	60-75	60-65	40-50	10-20

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
7:												
Typic Haplotorrox, windblown------	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20
Typic Torriorthents, badland--------	0-60	*Stony silty clay loam	*ML-K (proposed)	*A-7	0-10	5-10	100	95-100	95-100	85-95	40-50	10-20
8:												
Typic Haplotorrox, wind polished--	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	90-100	85-95	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	90-100	85-95	80-95	75-85	55-60	15-25
	32-60	*Silty clay loam	*ML-K (proposed)	*A-7	0	30-45	70-80	65-75	60-75	60-65	40-50	10-20
Typic Torriorthents, badland--------	0-60	*Stony silty clay loam	*ML-K (proposed)	*A-7	0-10	5-10	100	95-100	95-100	85-95	40-50	10-20
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
8:												
Typic Haplotorrox, windblown------	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20
9:												
Typic Torriorthents, eolian---------	0-9	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	9-60	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
Typic Haplotorrox, dark surface---	0-12	*Silty clay loam	*ML-K (proposed) CL-K (proposed)	*A-6, A-4	0	0-5	95-100	95-100	95-100	90-100	30-40	5-15
	12-60	*Silty clay loam	*ML-K (proposed) CL-K (proposed)	*A-6, A-4	0	0-5	95-100	95-100	95-100	90-100	30-40	5-15

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
11:												
Typic Torriorthents, eolian---------	0-9	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	9-60	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
Rock outcrop.												
12:												
Typic Haplotorrerts--	0-10	*Clay	*CH	*A-7	30-40	15-25	80-90	80-90	80-90	70-90	55-65	30-40
	10-60	*Clay	*CH	*A-7	20-30	15-25	70-80	70-80	70-80	65-80	60-80	30-50
Typic Haplocambids, deep-----------	0-9	*Silt loam	*ML-K (proposed)	*A-6, A-6	30-40	10-20	90-100	85-95	80-90	70-80	35-40	10-15
	9-34	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	34-50	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	50-80	*Bedrock			0	0	0	0	0	0	0-0	NP
Rock outcrop.												

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
12: Typic Torrifluvents--	0-7	*Silty clay	*ML-K (proposed) MH-K (proposed)	*A-7	0	0-5	95-100	95-100	85-95	80-95	40-60	10-25
	7-40	*Silty clay, silty clay loam	*ML-K (proposed) MH-K (proposed)	*A-7	0	0-5	95-100	90-100	80-90	75-90	40-60	10-25
	40-80	*Sand	*SP-SM	*A-3, A-2, A-1	0	0-5	85-95	80-90	40-60	5-10	0-14	NP
13: Typic Torrifluvents--	0-7	*Silty clay	*ML-K (proposed) MH-K (proposed)	*A-7	0	0-5	95-100	95-100	85-95	80-95	40-60	10-25
	7-40	*Silty clay, silty clay loam	*ML-K (proposed) MH-K (proposed)	*A-7	0	0-5	95-100	90-100	80-90	75-90	40-60	10-25
	40-80	*Sand	*SP-SM,	*A-3, A-2, A-1	0	0-5	85-95	80-90	40-60	5-10	0-14	NP
Beaches---------	0-13	*Sand	*SP-SM	*A-3, A-2	0-15	0-10	95-100	90-100	50-70	5-15	0-14	NP-2
	13-60	*Sand, loamy fine sand, loamy sand	*SP-SM	*A-3, A-2	0-15	0-10	95-100	90-100	50-80	5-15	0-14	NP-2
14: Typic Haplocambids, moderately deep----------	0-10	*Silt loam	*ML-K (proposed)	*A-6, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	10-31	*Stony clay	*ML-K (proposed)	*A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	31-60	*Bedrock			---	---	---	---	---	---	---	---

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
14:												
Lithic Torriorthents, extremely stony	0-3	*Silty clay loam	*CL-K (proposed)		20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	3-9	*Silty clay loam	*CL-K (proposed)		15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	9-16	*Silty clay loam			15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	16-60	*Bedrock			---	---	---	---	---	---	---	---
Typic Haplocambids, deep----------	0-9	*Silt loam	*ML-K (proposed)	*A-6, A-6	30-40	10-20	90-100	85-95	80-90	70-80	35-40	10-15
	9-34	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	34-50	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	50-80	*Bedrock			0	0	0	0	0	0	0-0	NP
Rock outcrop.												
15:												
Typic Haplocambids, moderately deep----------	0-10	*Silt loam	*ML-K (proposed)	*A-6, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	10-18	*Stony clay	*ML-K (proposed)	*A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	18-31	*Stony clay	*ML-K (proposed)	*A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	31-60	*Bedrock			---	---	---	---	---	---	---	---
Rock outcrop.												
Typic Haplocambids, deep----------	0-9	*Silt loam	*ML-K (proposed)	*A-6, A-6	30-40	10-20	90-100	85-95	80-90	70-80	35-40	10-15
	9-34	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	34-50	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	50-80	*Bedrock			0	0	0	0	0	0	0-0	NP

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
16:												
Typic Haplotorrox, windblown------	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
17:												
Typic Haplotorrox, windblown------	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
18:												
Typic Haplotorrox, black subsoil--	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
19:												
Typic Haplotorrox, windblown------	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20
Typic Haplotorrox----	0-6	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	6-12	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	12-22	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	22-36	*Silty clay	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25
	36-60	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	95-100	95-100	85-95	55-60	15-25

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
20:												
Rock outcrop.												
Lithic Torriorthents--	0-3	*Silty clay loam	CL-K (proposed)	*A-7, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	3-9	*Silty clay loam	CL-K (proposed)	*A-7, A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	9-16	*Silty clay loam			15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	16-20	*Bedrock			---	---	---	---	---	---	---	---
21:												
Rock outcrop.												
Typic Haplotorrerts--	0-10	*Clay	*CH	*A-7	30-40	15-25	80-90	80-90	80-90	70-90	55-65	30-40
	10-60	*Clay	*CH	*A-7	20-30	15-25	70-80	70-80	70-80	65-80	60-80	30-50
Typic Haplocambids, deep, very stony----------	0-9	*Silt loam	*ML-K (proposed)	*A-6, A-6	30-40	10-20	90-100	85-95	80-90	70-80	35-40	10-15
	9-34	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	34-50	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	50-80	*Bedrock			0	0	0	0	0	0	0-0	NP
22:												
Rock outcrop.												
Typic Haplocambids, moderately deep----------	0-10	*Silt loam	*ML-K (proposed)	*A-6, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	10-18	*Stony clay	*ML-K (proposed)	*A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	18-31	*Stony clay	*ML-K (proposed)	*A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	31-60	*Bedrock			---	---	---	---	---	---	---	---

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
23:												
Lithic Torriorthents--	0-3	*Silty clay loam	CL-K (proposed)	*A-7, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	3-9	*Silty clay loam	CL-K (proposed)	*A-7, A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	9-16	*Silty clay loam			15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	16-60	*Bedrock			---	---	---	---	---	---	---	---
Rock outcrop.												
24:												
Lithic Torriorthents--	0-3	*Silty clay loam	CL-K (proposed)	*A-7, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	3-9	*Silty clay loam	CL-K (proposed)	*A-7, A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	9-16	*Silty clay loam			15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	16-60	*Bedrock			---	---	---	---	---	---	---	---
Rock outcrop.												
25:												
Rock outcrop.												
Lithic Torriorthents--	0-3	*Silty clay loam	CL-K (proposed)	*A-7, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	3-9	*Silty clay loam	CL-K (proposed)	*A-7, A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	9-16	*Silty clay loam			15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	16-60	*Bedrock			---	---	---	---	---	---	---	---
26:												
Rubble land-----	0-60	*Extremely stony material	*GP	*A-1	55-75	15-25	0-10	0-5	0-5	0	0-0	NP
Typic Haplotorrerts--	0-10	*Extremely stony clay	*CH	*A-7	30-40	15-25	80-90	80-90	80-90	70-90	55-65	30-40
	10-60	*Extremely stony clay	*CH	*A-7	20-30	15-25	70-80	70-80	70-80	65-80	60-80	30-50

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
27:												
Typic Torriorthents, saprolite------	0-60	*Stony silty clay loam	*ML-K (proposed)	*A-7	0-10	5-10	100	95-100	95-100	85-95	40-50	10-20
Rock outcrop.												
Typic Haplotorrox, wind polished--	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	95-100	90-100	85-95	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	90-100	85-95	80-95	75-85	55-60	15-25
	32-60	*Silty clay loam	*ML-K (proposed)	*A-7	0	30-45	70-80	65-75	60-75	60-65	40-50	10-20
28:												
Typic Haplotorrerts, excavated------	0-10	*Extremely stony clay	*CH	*A-7	30-40	15-25	80-90	80-90	80-90	70-90	55-65	30-40
	10-60	*Extremely stony clay	*CH	*A-7	20-30	15-25	70-80	70-80	70-80	65-80	60-80	30-50
Urban land------	0-60	*Bedrock			0	0	0	0	0	0	0-0	NP
29:												
Typic Haplocambids, deep----------	0-9	*Silt loam	*ML-K (proposed)	*A-6, A-6	30-40	10-20	90-100	85-95	80-90	70-80	35-40	10-15
	9-34	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	34-50	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	50-80	*Bedrock			0	0	0	0	0	0	0-0	NP
Typic Haplocambids, moderately deep	0-10	*Silt loam	*ML-K (proposed)	*A-6, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	10-31	*Stony clay	*ML-K (proposed)	*A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	31-60	*Bedrock			---	---	---	---	---	---	---	---
Rock outcrop.												

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
30:												
Typic Haplocambids, deep----------	0-9	*Silt loam	*ML-K (proposed)	*A-6, A-6	30-40	10-20	90-100	85-95	80-90	70-80	35-40	10-15
	9-34	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	34-50	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	50-80	*Bedrock			0	0	0	0	0	0	0-0	NP
Typic Haplocambids, moderately deep	0-10	*Silt loam	*ML-K (proposed)	*A-6, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	10-31	*Stony clay	*ML-K (proposed)	*A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	31-60	*Bedrock			---	---	---	---	---	---	---	---
Rock outcrop.												
31:												
Typic Haplocambids, deep----------	0-9	*Silt loam	*ML-K (proposed)	*A-6, A-6	30-40	10-20	90-100	85-95	80-90	70-80	35-40	10-15
	9-34	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	34-50	*Stony silty clay loam	*ML-K (proposed)	*A-6, A-6	0-5	0-5	90-100	85-95	80-95	75-85	35-40	10-15
	50-80	*Bedrock			0	0	0	0	0	0	0-0	NP
Typic Haplocambids, moderately deep----------	0-10	*Silt loam	*ML-K (proposed)	*A-6, A-6	20-30	10-15	95-100	90-95	80-90	75-85	35-40	10-15
	10-31	*Stony clay	*ML-K (proposed)	*A-6	15-20	5-10	95-100	90-95	90-95	85-90	35-40	10-15
	31-60	*Bedrock			---	---	---	---	---	---	---	---
Rock outcrop.												

Table 8.—Engineering Index Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
32:												
Typic Haplotorrox, dark surface---	0-12	*Silty clay loam	*ML-K (proposed) CL-K (proposed)	*A-6, A-4	0	0-5	95-100	95-100	95-100	90-100	30-40	5-15
	12-60	*Silty clay loam	*ML-K (proposed) CL-K (proposed)	*A-6, A-4	0	0-5	95-100	95-100	95-100	90-100	30-40	5-15
Typic Haplotorrox, black subsoil--	0-8	*Silty clay loam	*MH-K (proposed)	*A-7	0	0-5	100	95-100	90-100	85-95	55-60	15-25
	8-15	*Silt loam	*MH-K (proposed)	*A-7	0	0	100	100	90-100	70-90	55-60	15-25
	15-32	*Silty clay loam	*MH-K (proposed)	*A-7	0	0	100	100	95-100	85-95	55-60	15-25
	32-60	*Very cobbly silty clay loam	*ML-K (proposed)	*A-7	0	0	70-80	65-75	60-75	60-65	40-50	10-20

Table 9.—Physical Soil Properties

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
1:											
Typic Torriorthents, badland----------	0-60	1.20-1.40	0.2-2	0.11-0.13	0.0-2.9	0.5-1.0	.15	.17	4	6	48
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
Rock outcrop.											
2:											
Typic Torriorthents, badland----------	0-60	1.20-1.40	0.2-2	0.11-0.13	0.0-2.9	0.5-1.0	.15	.17	4	6	48
Typic Torriorthents, eolian----------	0-9	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17	5	6	48
	9-60	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
Rock outcrop.											
4:											
Beaches----------	0-13	1.55-1.60	6-20	0.04-0.05	0.0-2.9	0.5-1.0	.10	.10	-	1	220
	13-60	1.40-1.60	6-20	0.04-0.08	0.0-2.9	0.0-0.0	.10	.10			
Rock outcrop.											
5:											
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			

Table 9.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
5:											
Typic Haplotorrox, windblown----------	0-8	1.60-1.80	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
6:											
Typic Haplotorrox, wind polished------	0-8	1.65-1.95	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
Typic Haplotorrox, windblown----------	0-8	1.60-1.80	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
Typic Torriorthents, badland----------	0-60	1.20-1.40	0.2-2	0.11-0.13	0.0-2.9	0.5-1.0	.15	.17	4	6	48
Typic Haplotorrox, wind polished------	0-8	1.65-1.95	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
7:											
Typic Haplotorrox, wind polished------	0-8	1.65-1.95	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
Typic Haplotorrox, windblown----------	0-8	1.60-1.80	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
Typic Torriorthents, badland----------	0-60	1.20-1.40	0.2-2	0.11-0.13	0.0-2.9	0.5-1.0	.15	.17	4	6	48

Table 9.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
8:											
Typic Haplotorrox, wind polished------	0-8	1.65-1.95	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
Typic Torriorthents, badland-----------	0-60	1.20-1.40	0.2-2	0.11-0.13	0.0-2.9	0.5-1.0	.15	.17	4	6	48
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
Typic Haplotorrox, windblown----------	0-8	1.60-1.80	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
9:											
Typic Torriorthents, eolian-------------	0-9	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17	5	6	48
	9-60	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
Typic Haplotorrox, dark surface-------	0-12	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-3.0	.17	.17	5	6	48
	12-60	1.10-1.20	0.06-0.6	0.09-0.11	0.0-2.9	0.5-1.0	.17	.17			
11:											
Typic Torriorthents, eolian-------------	0-9	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17	5	6	48
	9-60	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			

Table 9.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
11:											
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
Rock outcrop.											
12:											
Typic Haplotorrerts-	0-10	1.20-1.35	0.06-0.6	0.08-0.10	6.0-8.9	0.5-2.0	.28	.28	5	4	86
	10-60	1.20-1.35	0.00-0.2	0.08-0.10	6.0-8.9	0.1-0.9	.28	.28			
Typic Haplocambids, deep---	0-9	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	3	5	56
	9-34	1.10-1.20	0.6-6	0.15-0.19	0.0-2.9	0.5-1.0	.15	.17			
	34-50	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	50-80	---	0.00-0.06	0.05-0.07	0.0-0.0	0.0-0.0	.02	.02			
Rock outcrop.											
Typic Torrifluvents-	0-7	1.10-1.30	0.6-6	0.11-0.13	3.0-5.9	1.0-2.0	.17	.17	4	4	86
	7-40	1.10-1.30	0.2-2	0.11-0.13	3.0-5.9	0.5-1.0	.17	.17			
	40-80	1.10-1.14	6-20	0.05-0.07	0.0-2.9	1.0-2.0	.10	.10			
13:											
Typic Torrifluvents-	0-7	1.10-1.30	0.6-6	0.11-0.13	3.0-5.9	1.0-2.0	.17	.17	4	4	86
	7-40	1.10-1.30	0.2-2	0.11-0.13	3.0-5.9	0.5-1.0	.17	.17			
	40-80	1.10-1.14	6-20	0.05-0.07	0.0-2.9	1.0-2.0	.10	.10			
Beaches---	0-13	1.55-1.60	6-20	0.04-0.05	0.0-2.9	0.5-1.0	.10	.10	-	1	220
	13-60	1.40-1.60	6-20	0.04-0.08	0.0-2.9	0.0-0.0	.10	.10			
14:											
Typic Haplocambids, moderately deep---	0-10	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	2	5	56
	10-31	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	31-60	---	---	---	---	---	---	---			
Lithic Torriorthents, extremely stony---	0-3	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	1	6	48
	3-9	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	9-16	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	16-60	---	---	---	---	---	---	---			

Table 9.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
14:											
Typic Haplocambids, deep	0-9	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	3	5	56
	9-34	1.10-1.20	0.6-6	0.15-0.19	0.0-2.9	0.5-1.0	.15	.17			
	34-50	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	50-80	---	0.00-0.06	0.05-0.07	0.0-0.0	0.0-0.0	.02	.02			
Rock outcrop.											
15:											
Typic Haplocambids, moderately deep	0-10	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	2	5	56
	10-18	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	18-31	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	31-60	---	---	---	---	---	---	---			
Rock outcrop.											
Typic Haplocambids, deep	0-9	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	3	5	56
	9-34	1.10-1.20	0.6-6	0.15-0.19	0.0-2.9	0.5-1.0	.15	.17			
	34-50	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	50-80	---	0.00-0.06	0.05-0.07	0.0-0.0	0.0-0.0	.02	.02			
16:											
Typic Haplotorrox, windblown	0-8	1.60-1.80	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
Typic Haplotorrox	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
17:											
Typic Haplotorrox, windblown	0-8	1.60-1.80	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			

Table 9.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
17:											
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
18:											
Typic Haplotorrox, black subsoil------	0-8	1.60-1.80	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
19:											
Typic Haplotorrox, windblown----------	0-8	1.60-1.80	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
Typic Haplotorrox---	0-6	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.43	.43	5	6	48
	6-12	1.10-1.30	0.6-2	0.15-0.20	0.0-2.9	2.0-4.0	.17	.17			
	12-22	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	1.2-1.5	.17	.17			
	22-36	1.10-1.30	0.6-2	0.12-0.17	0.0-2.9	0.5-1.2	.17	.17			
	36-60	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.2	.17	.17			
20:											
Rock outcrop.											
Lithic Torriorthents------	0-3	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	1	6	48
	3-9	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	9-16	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	16-20	---	---	---	---	---	---	---			
21:											
Rock outcrop.											
Typic Haplotorrerts-	0-10	1.20-1.35	0.06-0.6	0.08-0.10	6.0-8.9	0.5-2.0	.28	.28	5	4	86
	10-60	1.20-1.35	0.00-0.2	0.08-0.10	6.0-8.9	0.1-0.9	.28	.28			

Table 9.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
21:											
Typic Haplocambids, deep, very stony---	0-9	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	3	5	56
	9-34	1.10-1.20	0.6-6	0.15-0.19	0.0-2.9	0.5-1.0	.15	.17			
	34-50	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	50-80	---	0.00-0.06	0.05-0.07	0.0-0.0	0.0-0.0	.02	.02			
22:											
Rock outcrop.											
Typic Haplocambids, moderately deep----	0-10	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	2	5	56
	10-18	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	18-31	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	31-60	---	---	---	---	---	---	---			
23:											
Lithic Torriorthents------	0-3	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	1	6	48
	3-9	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	9-16	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	16-60	---	---	---	---	---	---	---			
Rock outcrop.											
24:											
Lithic Torriorthents------	0-3	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	1	6	48
	3-9	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	9-16	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	16-60	---	---	---	---	---	---	---			
Rock outcrop.											
25:											
Rock outcrop.											
Lithic Torriorthents------	0-3	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	1	6	48
	3-9	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	9-16	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	16-60	---	---	---	---	---	---	---			

Table 9.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
26:											
Rubble land---------	0-60	---	20-20	0.00-0.10	0.0-0.0	0.0-0.1	.02	.02	-	---	---
Typic Haplotorrerts-	0-10	1.20-1.35	0.06-0.6	0.08-0.10	6.0-8.9	0.5-2.0	.28	.28	5	4	86
	10-60	1.20-1.35	0.00-0.2	0.08-0.10	6.0-8.9	0.1-0.9	.28	.28			
27:											
Typic Torriorthents, saprolite----------	0-60	1.20-1.40	0.2-2	0.11-0.13	0.0-2.9	0.5-1.0	.15	.17	4	6	48
Rock outcrop.											
Typic Haplotorrox, wind polished------	0-8	1.65-1.95	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			
28:											
Typic Haplotorrerts, excavated----------	0-10	1.20-1.35	0.06-0.6	0.08-0.10	6.0-8.9	0.5-2.0	.28	.28	5	4	86
	10-60	1.20-1.35	0.00-0.2	0.08-0.10	6.0-8.9	0.1-0.9	.28	.28			
Urban land----------	0-60	---	0.00-0.06	0.00-0.00	0.0-0.0	0.0-0.0	---	---	-	---	---
29:											
Typic Haplocambids deep----------	0-9	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	3	5	56
	9-34	1.10-1.20	0.6-6	0.15-0.19	0.0-2.9	0.5-1.0	.15	.17			
	34-50	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	50-80	---	0.00-0.06	0.05-0.07	0.0-0.0	0.0-0.0	.02	.02			
Typic Haplocambids, moderately deep----	0-10	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	2	5	56
	10-31	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	31-60	---	---	---	---	---	---	---			
Rock outcrop.											
30:											
Typic Haplocambids, deep----------	0-9	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	3	5	56
	9-34	1.10-1.20	0.6-6	0.15-0.19	0.0-2.9	0.5-1.0	.15	.17			
	34-50	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	50-80	---	0.00-0.06	0.05-0.07	0.0-0.0	0.0-0.0	.02	.02			

Table 9.—Physical Soil Properties—Continued

Map symbol and soil name	Depth	Moist bulk density	Permeability (Ksat)	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
							Kw	Kf	T		
	In	g/cc	In/hr	In/in	Pct	Pct					
30:											
Typic Haplocambids, moderately deep----	0-10	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	2	5	56
	10-31	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	31-60	---	---	---	---	---	---	---			
Rock outcrop.											
31:											
Typic Haplocambids, deep----------	0-9	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	3	5	56
	9-34	1.10-1.20	0.6-6	0.15-0.19	0.0-2.9	0.5-1.0	.15	.17			
	34-50	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	50-80	---	0.00-0.06	0.05-0.07	0.0-0.0	0.0-0.0	.02	.02			
Typic Haplocambids, moderately deep----	0-10	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-2.0	.17	.17	2	5	56
	10-31	1.10-1.20	0.6-6	0.08-0.10	0.0-2.9	0.5-1.0	.15	.17			
	31-60	---	---	---	---	---	---	---			
Rock outcrop.											
32:											
Typic Haplotorrox, dark surface-------	0-12	1.10-1.20	0.6-2	0.09-0.11	0.0-2.9	1.0-3.0	.17	.17	5	6	48
	12-60	1.10-1.20	0.06-0.6	0.09-0.11	0.0-2.9	0.5-1.0	.17	.17			
Typic Haplotorrox, black subsoil------	0-8	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17	5	6	48
	8-15	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	15-32	1.10-1.30	0.6-2	0.10-0.14	0.0-2.9	0.5-1.0	.17	.17			
	32-60	1.20-1.40	0.2-2	0.06-0.08	0.0-2.9	0.5-1.0	.15	.17			

Table 10.—Chemical Soil Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	mmhos/cm	
1:						
Typic Torriorthents, badland	0-60	5.0-10	5.6-7.3	0	0	0
Typic Haplotorrox	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
Rock outcrop.						
2:						
Typic Torriorthents, badland	0-60	5.0-10	5.6-7.3	0	0	0
Typic Torriorthents, eolian	0-9	10-15	6.0-7.0	0	0	1-5
	9-60	10-15	6.5-7.4	0	0	1-5
Typic Haplotorrox	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
Rock outcrop.						
4:						
Beaches	0-13	0.0-4.6	6.6-7.3	90-99	0	0
	13-60	0.0-1.6	6.6-8.4	90-99	0	0
Rock outcrop.						
5:						
Typic Haplotorrox	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
Typic Haplotorrox, windblown	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0
6:						
Typic Haplotorrox, wind polished	0-8	10-15	6.0-7.2	0	0	1-5
	8-15	5.0-10	6.0-7.2	0	0	5-10
	15-32	5.0-10	6.0-7.2	0	0	5-10
	32-60	5.0-10	6.0-7.2	0	0	0

Table 10.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	mmhos/cm	
6:						
Typic Haplotorrox, windblown	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0
Typic Torriorthents, badland	0-60	5.0-10	5.6-7.3	0	0	0
Typic Haplotorrox, wind polished	0-8	10-15	6.0-7.2	0	0	1-5
	8-15	5.0-10	6.0-7.2	0	0	5-10
	15-32	5.0-10	6.0-7.2	0	0	5-10
	32-60	5.0-10	6.0-7.2	0	0	0
7:						
Typic Haplotorrox, wind polished	0-8	10-15	6.0-7.2	0	0	1-5
	8-15	5.0-10	6.0-7.2	0	0	5-10
	15-32	5.0-10	6.0-7.2	0	0	5-10
	32-60	5.0-10	6.0-7.2	0	0	0
Typic Haplotorrox, windblown	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0
Typic Torriorthents, badland	0-60	5.0-10	5.6-7.3	0	0	0
8:						
Typic Haplotorrox, wind polished	0-8	10-15	6.0-7.2	0	0	1-5
	8-15	5.0-10	6.0-7.2	0	0	5-10
	15-32	5.0-10	6.0-7.2	0	0	5-10
	32-60	5.0-10	6.0-7.2	0	0	0
Typic Torriorthents, badland	0-60	5.0-10	5.6-7.3	0	0	0
Typic Haplotorrox	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
Typic Haplotorrox, windblown	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0
9:						
Typic Torriorthents, eolian	0-9	10-15	6.0-7.0	0	0	1-5
	9-60	10-15	6.5-7.4	0	0	1-5

Table 10.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	mmhos/cm	
9:						
Typic Haplotorrox----	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
Typic Haplotorrox, dark surface--------	0-12	11-15	6.6-7.8	0	0	0
	12-60	7.3-13	6.6-7.8	0	0	0
11:						
Typic Torriorthents, eolian----------	0-9	10-15	6.0-7.0	0	0	1-5
	9-60	10-15	6.5-7.4	0	0	1-5
Typic Haplotorrox----	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
Rock outcrop.						
12:						
Typic Haplotorrerts--	0-10	27-59	6.6-7.3	0	0	0
	10-60	17-50	5.6-7.3	0	0	0
Typic Haplocambids, deep----------	0-9	12-16	6.1-7.3	0	0	0
	9-34	11-17	6.6-7.3	0	0	0
	34-50	11-17	6.6-7.3	0	0	0
	50-80	---	---	---	---	---
Rock outcrop.						
Typic Torrifluvents--	0-7	13-17	6.1-6.5	0	0	0
	7-40	7.9-13	6.1-7.8	0	0	0
	40-80	0.3-1.3	7.4-8.4	90-99	0.0-4.0	0
13:						
Typic Torrifluvents--	0-7	13-17	6.1-6.5	0	0	0
	7-40	7.9-13	6.1-7.8	0	0	0
	40-80	0.3-1.3	7.4-8.4	90-99	0.0-4.0	0
Beaches----------	0-13	0.0-4.6	6.6-7.3	90-99	0	0
	13-60	0.0-1.6	6.6-8.4	90-99	0	0
14:						
Typic Haplocambids, moderately deep-----	0-10	12-16	6.1-7.3	0	0	0
	10-31	11-17	6.6-7.8	0	0	0
	31-60	---	---	---	---	0
Lithic Torriorthents, extremely stony-----	0-3	12-16	6.1-7.3	0	0	0
	3-9	11-17	6.6-7.8	0	0	0
	9-16	11-17	6.6-7.8	0	0	0
	16-60	---	---	---	---	---

Table 10.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	mmhos/cm	
14:						
Typic Haplocambids, deep	0-9	12-16	6.1-7.3	0	0	0
	9-34	11-17	6.6-7.3	0	0	0
	34-50	11-17	6.6-7.3	0	0	0
	50-80	---	---	---	---	---
Rock outcrop.						
15:						
Typic Haplocambids, moderately deep	0-10	12-16	6.1-7.3	0	0	0
	10-18	11-17	6.6-7.8	0	0	0
	18-31	11-17	6.6-7.8	0	0	0
	31-60	---	---	---	---	---
Rock outcrop.						
Typic Haplocambids, deep	0-9	12-16	6.1-7.3	0	0	0
	9-34	11-17	6.6-7.3	0	0	0
	34-50	11-17	6.6-7.3	0	0	0
	50-80	---	---	---	---	---
16:						
Typic Haplotorrox, windblown	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0
Typic Haplotorrox	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
17:						
Typic Haplotorrox, windblown	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0
Typic Haplotorrox	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
18:						
Typic Haplotorrox, black subsoil	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0

Table 10.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	mmhos/cm	
18:						
Typic Haplotorrox----	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
19:						
Typic Haplotorrox, windblown----------	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0
Typic Haplotorrox----	0-6	10-15	6.0-6.8	0	0	1-5
	6-12	10-15	6.0-7.0	0	0	1-5
	12-22	10-15	6.5-7.4	0	0	1-5
	22-36	5.0-10	6.5-7.4	0	0	5-10
	36-60	5.0-10	6.5-7.5	0	0	5-10
20:						
Rock outcrop.						
Lithic Torriorthents-------	0-3	12-16	6.1-7.3	0	0	0
	3-9	11-17	6.6-7.8	0	0	0
	9-16	11-17	6.6-7.8	0	0	0
	16-20	---	---	---	---	---
21:						
Rock outcrop.						
Typic Haplotorrerts--	0-10	27-59	6.6-7.3	0	0	0
	10-60	17-50	5.6-7.3	0	0	0
Typic Haplocambids, deep, very stony----	0-9	12-16	6.1-7.3	0	0	0
	9-34	11-17	6.6-7.3	0	0	0
	34-50	11-17	6.6-7.3	0	0	0
	50-80	---	---	---	---	---
22:						
Rock outcrop.						
Typic Haplocambids, moderately deep-----	0-10	12-16	6.1-7.3	0	0	0
	10-18	11-17	6.6-7.8	0	0	0
	18-31	11-17	6.6-7.8	0	0	0
	31-60	---	---	---	---	---
23:						
Lithic Torriorthents-------	0-3	12-16	6.1-7.3	0	0	0
	3-9	11-17	6.6-7.8	0	0	0
	9-16	11-17	6.6-7.8	0	0	0
	16-60	---	---	---	---	---
Rock outcrop.						

Table 10.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	mmhos/cm	
24:						
Lithic Torriorthents-------	0-3	12-16	6.1-7.3	0	0	0
	3-9	11-17	6.6-7.8	0	0	0
	9-16	11-17	6.6-7.8	0	0	0
	16-60	---	---	---	---	---
Rock outcrop.						
25:						
Rock outcrop.						
Lithic Torriorthents-------	0-3	12-16	6.1-7.3	0	0	0
	3-9	11-17	6.6-7.8	0	0	0
	9-16	11-17	6.6-7.8	0	0	0
	16-60	---	---	---	---	---
26:						
Rubble land.						
Typic Haplotorrerts--	0-10	27-59	6.6-7.3	0	0	0
	10-60	17-50	5.6-7.3	0	0	0
27:						
Typic Torriorthents, saprolite----------	0-60	5.0-10	5.6-7.3	0	0	0
Rock outcrop.						
Typic Haplotorrox, wind polished-------	0-8	10-15	6.0-7.2	0	0	1-5
	8-15	5.0-10	6.0-7.2	0	0	5-10
	15-32	5.0-10	6.0-7.2	0	0	5-10
	32-60	5.0-10	6.0-7.2	0	0	0
28:						
Typic Haplotorrerts, excavated----------	0-10	27-59	6.6-7.3	0	0	0
	10-60	17-50	5.6-7.3	0	0	0
Urban land.						
29:						
Typic Haplocambids, deep----------	0-9	12-16	6.1-7.3	0	0	0
	9-34	11-17	6.6-7.3	0	0	0
	34-50	11-17	6.6-7.3	0	0	0
	50-80	---	---	---	---	---
Typic Haplocambids, moderately deep-----	0-10	12-16	6.1-7.3	0	0	0
	10-31	11-17	6.6-7.8	0	0	0
	31-60	---	---	---	---	---
Rock outcrop.						

Table 10.—Chemical Soil Properties—Continued

Map symbol and soil name	Depth	Cation-exchange capacity	Soil reaction	Calcium carbonate	Salinity	Sodium adsorption ratio
	Inches	meq/100 g	pH	Pct	mmhos/cm	
30:						
Typic Haplocambids, deep	0-9	12-16	6.1-7.3	0	0	0
	9-34	11-17	6.6-7.3	0	0	0
	34-50	11-17	6.6-7.3	0	0	0
	50-80	---	---	---	---	---
Typic Haplocambids, moderately deep	0-10	12-16	6.1-7.3	0	0	0
	10-31	11-17	6.6-7.8	0	0	0
	31-60	---	---	---	---	---
Rock outcrop.						
31:						
Typic Haplocambids, deep	0-9	12-16	6.1-7.3	0	0	0
	9-34	11-17	6.6-7.3	0	0	0
	34-50	11-17	6.6-7.3	0	0	0
	50-80	---	---	---	---	---
Typic Haplocambids, moderately deep	0-10	12-16	6.1-7.3	0	0	0
	10-31	11-17	6.6-7.8	0	0	0
	31-60	---	---	---	---	---
Rock outcrop.						
32:						
Typic Haplotorrox, dark surface	0-12	11-15	6.6-7.8	0	0	0
	12-60	7.3-13	6.6-7.8	0	0	0
Typic Haplotorrox, black subsoil	0-8	10-15	6.3-7.2	0	0	1-5
	8-15	5.0-10	6.3-7.2	0	0	5-10
	15-32	5.0-10	6.3-7.2	0	0	5-10
	32-60	5.0-10	6.3-7.8	0	0	0

Table 11.—Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Restrictive layer			Risk of corrosion	
	Kind	Depth to top	Hardness	Uncoated steel	Concrete
		In			
1:					
Typic Torriorthents, badland	---	---	---	Moderate	Moderate
Typic Haplotorrox	---	---	---	High	High
Rock outcrop.					
2:					
Typic Torriorthents, badland	---	---	---	Moderate	Moderate
Typic Torriorthents, eolian	---	---	---	High	High
Typic Haplotorrox	---	---	---	High	High
Rock outcrop.					
4:					
Beaches	---	---	---	Moderate	Low
Rock outcrop.					
5:					
Typic Haplotorrox	---	---	---	High	High
Typic Haplotorrox, windblown	---	---	---	High	High
6:					
Typic Haplotorrox, wind polished	---	---	---	High	High
Typic Haplotorrox, windblown	---	---	---	High	High
Typic Torriorthents, badland	---	---	---	Moderate	Moderate
Typic Haplotorrox, wind polished	---	---	---	High	High
7:					
Typic Haplotorrox, wind polished	---	---	---	High	High
Typic Haplotorrox, windblown	---	---	---	High	High
Typic Torriorthents, badland	---	---	---	Moderate	Moderate

Table 11.—Soil Features—Continued

Map symbol and soil name	Restrictive layer			Risk of corrosion	
	Kind	Depth to top	Hardness	Uncoated steel	Concrete
		In			
8:					
Typic Haplotorrox, wind polished	---	---	---	High	High
Typic Torriorthents, badland	---	---	---	Moderate	Moderate
Typic Haplotorrox	---	---	---	High	High
Typic Haplotorrox, windblown	---	---	---	High	High
9:					
Typic Torriorthents, eolian	---	---	---	High	High
Typic Haplotorrox	---	---	---	High	High
Typic Haplotorrox, dark surface	---	---	---	Low	Low
11:					
Typic Torriorthents, eolian	---	---	---	High	High
Typic Haplotorrox	---	---	---	High	High
Rock outcrop.					
12:					
Typic Haplotorrerts	---	---	---	Moderate	Moderate
Typic Haplocambids, deep	Lithic bedrock	40-60	Indurated	Moderate	Low
Rock outcrop.					
Typic Torrifluvents	---	---	---	High	Low
13:					
Typic Torrifluvents	---	---	---	High	Low
Beaches	---	---	---	Moderate	Low
14:					
Typic Haplocambids, moderately deep	Lithic bedrock	20-40	Indurated	Moderate	Low
Lithic Torriorthents, extremely stony	Lithic bedrock	---	Very strongly cemented	Moderate	Low
Typic Haplocambids, deep	Lithic bedrock	40-60	Indurated	Moderate	Low
Rock outcrop.					

Table 11.—Soil Features—Continued

Map symbol and soil name	Restrictive layer			Risk of corrosion	
	Kind	Depth to top	Hardness	Uncoated steel	Concrete
		In			
15:					
Typic Haplocambids, moderately deep	Lithic bedrock	20-40	Indurated	Moderate	Low
Rock outcrop.					
Typic Haplocambids, deep	Lithic bedrock	40-60	Indurated	Moderate	Low
16:					
Typic Haplotorrox, windblown	---	---	---	High	High
Typic Haplotorrox	---	---	---	High	High
17:					
Typic Haplotorrox, windblown	---	---	---	High	High
Typic Haplotorrox	---	---	---	High	High
18:					
Typic Haplotorrox, black subsoil	---	---	---	High	High
Typic Haplotorrox	---	---	---	High	High
19:					
Typic Haplotorrox, windblown	---	---	---	High	High
Typic Haplotorrox	---	---	---	High	High
20:					
Rock outcrop.					
Lithic Torriorthents	Lithic bedrock	---	Very strongly cemented	Moderate	Low
21:					
Rock outcrop.					
Typic Haplotorrerts	---	---	---	Moderate	Moderate
Typic Haplocambids, deep, very stony	Lithic bedrock	40-60	Indurated	Moderate	Low
22:					
Rock outcrop.					
Typic Haplocambids, moderately deep	Lithic bedrock	20-40	Indurated	Moderate	Low
23:					
Lithic Torriorthents	Lithic bedrock	---	Very strongly cemented	Moderate	Low
Rock outcrop.					

Table 11.—Soil Features—Continued

Map symbol and soil name	Restrictive layer			Risk of corrosion	
	Kind	Depth to top	Hardness	Uncoated steel	Concrete
		In			
24:					
Lithic Torriorthents---	Lithic bedrock	---	Very strongly cemented	Moderate	Low
Rock outcrop.					
25:					
Rock outcrop.					
Lithic Torriorthents---	Lithic bedrock	---	Very strongly cemented	Moderate	Low
26:					
Rubble land.					
Typic Haplotorrerts----	---	---	---	Moderate	Moderate
27:					
Typic Torriorthents, saprolite----------	---	---	---	Moderate	Moderate
Rock outcrop.					
Typic Haplotorrox, wind polished----------	---	---	---	High	High
28:					
Typic Haplotorrerts, excavated----------	---	---	---	Moderate	Moderate
Urban land----------	Human-manufactured materials	0-0	Indurated	---	---
29:					
Typic Haplocambids, deep----------	Lithic bedrock	40-60	Indurated	Moderate	Low
Typic Haplocambids, moderately deep-------	Lithic bedrock	20-40	Indurated	Moderate	Low
Rock outcrop.					
30:					
Typic Haplocambids, deep----------	Lithic bedrock	40-60	Indurated	Moderate	Low
Typic Haplocambids, moderately deep-------	Lithic bedrock	20-40	Indurated	Moderate	Low
Rock outcrop.					
31:					
Typic Haplocambids, deep----------	Lithic bedrock	40-60	Indurated	Moderate	Low
Typic Haplocambids, moderately deep-------	Lithic bedrock	20-40	Indurated	Moderate	Low
Rock outcrop.					

Table 11.—Soil Features—Continued

Map symbol and soil name	Restrictive layer			Risk of corrosion	
	Kind	Depth to top	Hardness	Uncoated steel	Concrete
		In			
32:					
Typic Haplotorrox, dark surface	---	---	---	Low	Low
Typic Haplotorrox, black subsoil	---	---	---	High	High

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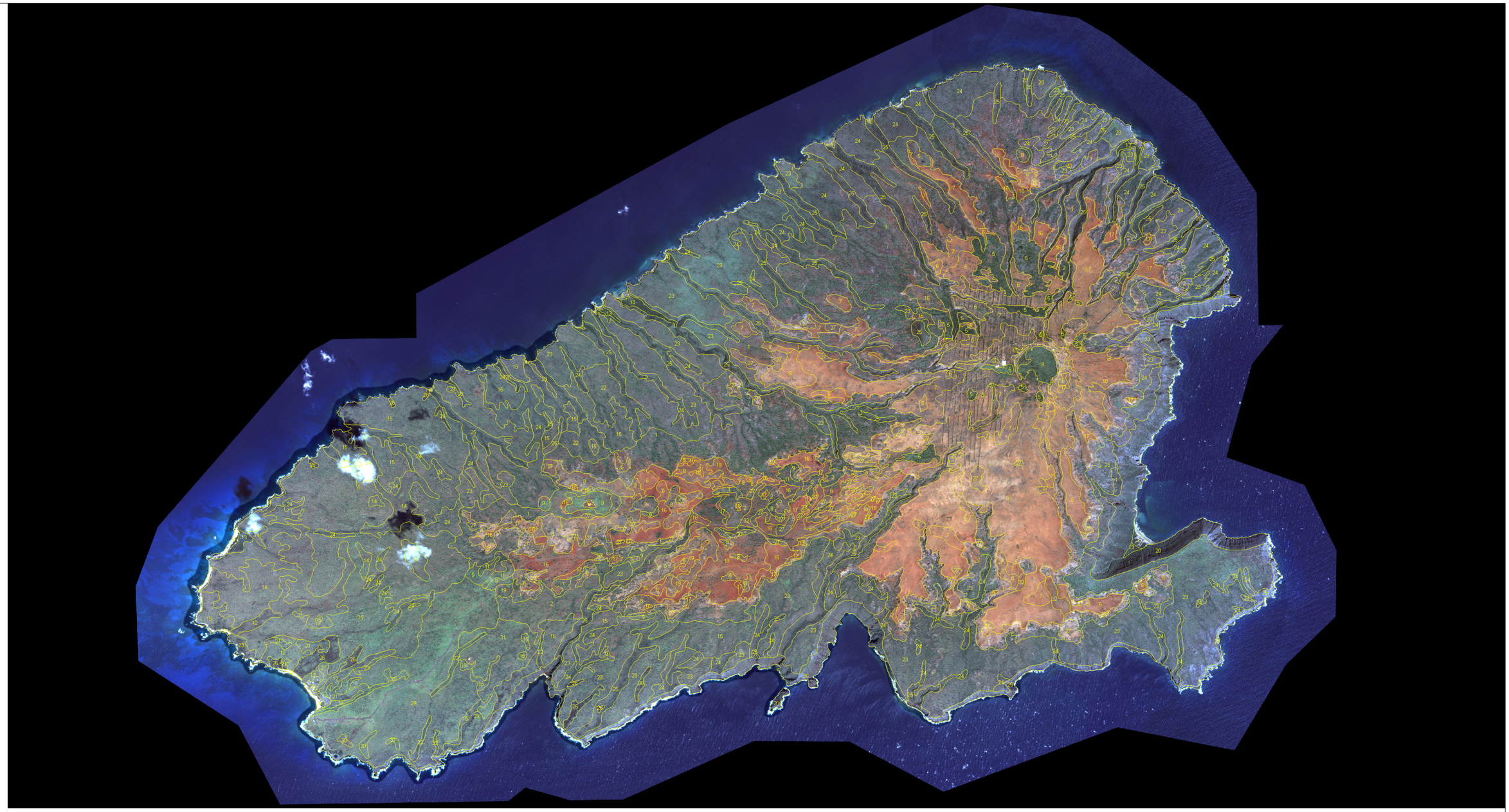
Soil Survey of Island of Kahoolawe, Hawaii



MAP UNIT LEGEND

Symbol and Map Unit Name

1 Typic Torriorthents, badlands-Typic Haplotorrox-Rock outcrop complex,10 to 30 percent slopes
2 Typic Torriorthents, badlands-Typic Torriorthents, eolian, complex,5 to 25 percent slopes
4 Beaches, 0 to 5 percent slopes
5 Typic Haplotorrox, 5 to 15 percent slopes
6 Typic Haplotorrox, wind polished, 3 to12 percent slopes
7 Typic Haplotorrox, wind polished, 12 to 20 percent slopes
8 Typic Haplotorrox, wind polished-Typic Torriorthents, badlands, complex, 3 to 12 percent slopes
9 Typic Torriorthents, eolian, 3 to 15 percent slopes
11 Typic Torriorthents, eolian, 15 to 30 percent slopes
12 Typic Haplotorrerts, extremely stony, 3 to 15 percent slopes
13 Typic Torrifluvents, 0 to 6 percent slopes
14 Typic Haplocambids, moderately deep, 3 to 12 percent slopes
15 Typic Haplocambids, moderately deep-Rock outcrop complex, 5 to 20 percent slopes
16 Typic Haplotorrox, windblown, 3 to 12 percent slopes
17 Typic Haplotorrox, windblown, 8 to 20 percent slopes
18 Typic Haplotorrox, black subsoil, 8 to 20 percent slopes, gullied
19 Typic Haplotorrox, windblown, 3 to 8 percent slopes, hummocky
20 Rock outcrop-Lithic Torriorthents complex, 50 to 150 percent slopes
21 Rock outcrop-Typic Haplotorrerts complex, 8 to 20 percent slopes
22 Rock outcrop-Typic Haplocambid, moderately deep, complex, 12 to 25 percent slopes
23 Lithic Torriorthents-Rock outcrop complex, 5 to 15 percent slopes
24 Lithic Torriorthents-Rock outcrop complex, 15 to 30 percent slopes
25 Rock outcrop-Lithic Torriorthents complex, 30 to 50 percent slopes
26 Rubble land, 3 to 12 percent slopes
27 Typic Torriorthents, saprolite-Rock outcrop complex, 5 to 20 percent slopes
28 Typic Haplotorrerts, excavated-Urban Land complex, 0 to 8 percent slopes
29 Typic Haplocambids,deep, 3 to 12 percent slopes
30 Typic Haplocambids,deep, 8 to 20 percent slopes
31 Typic Haplocambids, deep-Typic Haplocambids, moderately deep complex, 3 to 8 percent slopes
32 Typic Haplotorrox, dark surface, 3 to 8 percent slopes, severely eroded

0 1.25 2.5 5 Miles

1:24,000

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Created 2/3/2011 by Michael Kolman
Soil Survey Area: Island of Kahoolawe, Hawaii
Survey Area Data: Version 1, Oct 21, 2010